The Sight-Saving Review

Volume IX **Number 2**

June, 1939

Table of Contents

PAGE

THE RÔLE OF LIGHT IN EDUCATION, N. Bishop Harman, F.R.C.S. 83

THE HEAD AND EYE PROTECTION CODE OF THE NATIONAL BUREAU OF STANDARDS, M. G. Lloyd 98

FIFTEEN YEARS' PROGRESS IN EYESIGHT CONSERVATION IN INDUSTRY, Louis Resnick 105

INDUSTRIAL EYE PROTECTION PROGRAM: HOW IS IT SET UP? HOW IS IT PUT ACROSS? HOW IS IT KEPT ACROSS? Harry Guilbert 114

MODERN CONCEPTIONS OF CONSERVATION OF VISION, Conrad Berens, M.D. 119

PREVENTION OF BLINDNESS FROM OPHTHALMIA NEONATORUM 126

THE FORUM:
The Story of a Fireworks Bill, Evelyn M. Carpenter 150

NEWS OF STATE ACTIVITIES 153

CURRENT PUBLICATIONS ON SIGHT CONSERVATION 159

CONTRIBUTORS TO THIS ISSUE 160

Because of their omission for lack of space in this issue, the sections devoted to Note and Comment, Current Articles of Interest, and Book Reviews, will appear more extensively than usual in the September REVIEW.

The Rôle of Light In Education*

N. Bishop Harman, M.A., M.D., F.R.C.S.

OUR measure of desirable light, says the author, "has changed amazingly in recent years. . . The whole aspect of the school is vastly more cheerful, and so to the advantage of the children"

WHEN your President asked me to introduce this subject to you I thought for a moment that the case for good lighting in schools, colleges, and universities was so well established that there was scarcely need for further advocacy; all that could be said or done was to point to the great changes that have been witnessed in the last forty years. But this first thought of mine was wrong. I saw with my own eyes in a school in London, two months ago, in November, 1938, conditions of lighting that were familiar enough at the turn of the century, but which I thought had been abolished long since. In one of the wealthiest boroughs of London I came across a school of the non-provided type. The infants' department was below the level of the pavement, so that I could look down upon the children in the class. There was no teacher in the room. The children were doing some kindergarten work which certainly amused them. The afternoon daylight was that of November; little of it got into the room. The main source of light was from the gas fittings. The pendants were those I knew in my school days, vertical pipes with widespread, horizontal arms. It was clear that these had originally been fitted with naked fish-tail burners, but in this room they had been changed to naked incandescent gas mantles. Position, height, and diffusion were hopelessly wrong. The light at the desk level was less than one foot-candle. That class room remains the same today, in the year 1939.

In 1900 the possibilities and range of lighting effects were small

* Presented before the Medical Officers of Schools Association, January, 1939, and reprinted with permission from *Public Health* (London), March, 1939.

and limited. Today they are great and almost unlimited. Then it was impracticable to supply an illuminant giving 10 foot-candles in a classroom; now a supply of 50 foot-candles is easy, safe, and not costly.

The illuminating engineer has developed the power and intrinsic brilliance of illuminants to such a high degree that we are now usually less concerned with securing enough light than with making sure that the light is so arranged that it shall not be harmful to the eyes of the children. Too little light makes work fatiguing, but the weariness induced is of the sort that tends to make us cease trying to work. In the school the child becomes listless or lazy. Excess of light, or ill-arranged light, causes glare that is definitely distressing to the eyes, and through them to the nervous mechanism of the sufferer. In a classroom, whence there is no escape, the child is subjected to conditions that are little less than torture.

Reactions of the Eyes to Light

Light is only recognizable by eyes that see. A consideration of the conditions under which our eyes see cannot fail to fill us with wonder at their amazing adaptability to variant conditions. When we are out-of-doors on a clear, sunny day in some pleasant green field of this country, the light is something like 10,000 foot-candles; even in the shade of a tree or when the sun is hidden by thin clouds it may equal 1,000 to 2,000 foot-candles. Yet our eyes are happy in both conditions. When the sunshine is reflected from the paved street of the city or the waves of the sea, then our eyes begin to protest: tears flow, and an orbicular spasm may induce a temporary blindness. When the sun sets we illumine our homes and streets with lights that are miserably feeble in comparison with the daylight; two or three foot-candles is a fair average in the home, yet our faithful eyes adapt themselves to the altered circumstances, so that in these days we work and play as much by artificial light as we do by daylight, and maybe more.

The power of adaptation of our eyes is wonderful. It is a marvellous piece of automatic and precise adjustment. The adjustment is based upon the fact that the eyes themselves need a relatively small amount of light to see by, but they want that little light to be good. In the sunlight the pupils contract to their

smallest diameter to exclude excess of light, and in so doing they improve the accuracy of vision by cutting off spherical aberration just as does a stenopaeic disc or pin-hole camera. An eye with a dilated or paralyzed pupil is a constant source of annoyance to the owner.

In these days we naturally scorn a light measured by one foot-candle, but the light of a single candle at the distance of one foot, if it be properly shaded from direct exposure to the eyes, will form a perfectly satisfactory illuminant for reading ordinary print, as our ancestors knew full well. Most of us, I have no doubt, have read a newspaper by moonlight, by a light the measured value of which is perhaps no more than one-fiftieth of a foot-candle.

Again, the difference in the lighting in our rooms is balanced by our eyes. In the various parts of most rooms there may be a 90 per cent difference in the value of the daylight on the desks by the window and on the desks against the far side wall. Something of the measure of the difference of visibility can be gauged by the experience of the photographer: outside a building he can take an instantaneous photograph in a fraction of a second; inside he will need an exposure of minutes. Our eyes can do better than that, for within a few moments of our entry in the dimly lit building we can see as readily as we had previously done out-of-doors.

There is no doubt that sight, or visual acuity, is increased up to a point by the increase of light. This is recognized by ophthalmic surgeons, so that now there is a standard of lighting recommended for vision test cards, with the intent that the conditions of, and therefore the responses to, these tests shall be as nearly equal as possible. The improvement in the visual acuity advances up to a point. If the lighting be excessive, vision is reduced; for example, when we look from the back of a room at a sun-lit window, then we may be unable to see the mullions and transoms that cross it. This is an example of glare and of its disturbing effects. There has been an astonishing change in recent years in our appreciation of the correlation of light and vision. Uhthoff (1886) claimed that the visual acuity is highest when the illumination reaches 3.3 foot-candles; Ferree and Rand (1920) found it at maximum at 20 foot-candles; Burnap and Jackson (1928) found it improves up to 500 foot-candles; R. J. Lythgoe (1932), in a most exhaustive study,

saw it continue to improve up to and beyond 1,275 foot-candles; and Eguchi (1931) claimed that it improved with an intensity even greater than 7,750 foot-candles.

The Rôle of Education in Lighting

After this statement of the reactions of our eyes to light I propose to comment upon the reactions of modern authorities to a piece of ocular hygiene that was initiated by school doctors, or doctors interested in school work. In this section I would alter the title of my paper from "The Rôle of Light in Education" to "The Rôle of Education in Lighting." I think I shall be able to show that the endeavor of the school doctor to secure reasonable and good lighting for the school children has had a far greater effect than any one of the pioneers thought possible at the time of his work. The effect has spread far beyond the schools, and the advance secured is a notable instance of the inevitable contagiousness of a good example. From such a notable experience we may reinforce our efforts in our field of work, and encourage ourselves to carry on with that work even though at times it may seem that we are talking to authorities who are deaf or at least indifferent to our plea for improvement.

James Ware, an ophthalmic surgeon of London, and a Fellow of the Royal Society, is to be credited with the earliest recorded attempt at school medical inspection and inquiry into the state of the eyes of the children. In a paper written in 1813 he wrote: "With regard to the proportion between the numbers of near-sighted persons in the different ranks of society, I have taken pains to obtain satisfactory information, by making inquiries in those places where a large number in these several classes are associated together." He found those persons in the military barracks, in a Chelsea school for the children of soldiers, and in the colleges in Oxford and Cambridge. Among the conclusions he came to are two that hold good today. "That: near-sightedness is rarely observed in infants or even in children under ten years of age. It affects the higher classes of society more than the lower. . . ." But the effects of light upon the sight escaped his attention; he was more concerned with internal causes.

It was not until 70 years later we have any certain record of an

investigation into lighting conditions. It is to the enduring credit of Hermann Cohn that a real advance was made in the hygiene of the eyes of school children. In his book, which is quite small and written with commendable simplicity and brevity, his own work, and that of others of his time and before him, is set out. He has a chapter on natural lighting and one on artificial lighting. On page 131 he shows how systematic was his approach to the classroom. He writes: "In my investigation in Breslau I have drawn up a light-table for every classroom, based upon the following questions:

> How many windows are there at the right, left, front, and back of the writer?
> How many windows facing east, west, north, and south?
> Of what color are the walls?
> How far off?
> Of what height and width are the windows?
> In what story is the room?"

He regrets that "at that time there was no photometer" convenient for school work. But he found that, by comparing the lighting of two rooms, "the human eye itself is in some cases the best photometer." He names half-a-dozen other workers who had investigated schoolroom lighting. He plumps for the glass roof, following the lead of Javal of Paris. Of artificial lighting, he says it was by gas. "The flames were in no single case provided with a shade." He says it was nearly as bad in the University lecture rooms until after his report was presented.

I pass now to the beginning of this century, when school medical inspection was instituted in earnest in this country. It is significant that it began with the investigation of the sight of the children. In London Dr. James Kerr, who was then the medical officer of the School Board for London, set some half-a-dozen young ophthalmic surgeons to work in the schools, each for three half-days a week. I was one of them. Our work was the routine testing of the visual acuity of the children. But we are told that any relevant investigation might be carried out and counted as part of our work. This was a distinctly wise provision. The reports obtained led to a systematic investigation of school conditions. On page 29 of the

report for March 25, 1904, there is set out a table giving the results of some of these early investigations. The noteworthy feature of that table was the finding that, whereas in boys', girls', and mixed departments, natural lighting was satisfactory in the majority of classrooms, there was a heavy incidence of "bad" lighting in the infants' departments. My share in that work led to the publication, in the Report of the Education Committee of the London County Council in 1907, of an account of experiments carried out in artificial lighting of classrooms.

In 1909 the Illuminating Engineering Society (of London) was founded, and speedily got to work by means of committees and discussions, making recommendations for the improvement of lighting. In 1910 there was a discussion on "Glare, Its Causes and Effects." In 1911 the subject for consideration was "School Lighting." Natural lighting was introduced by Dr. Kerr, and artificial lighting by myself. This discussion was extended to the illumination of some London colleges by Leon Gaster and J. S. Dow. Similar work was being done abroad, notably by the New York Section of the Illuminating Engineering Society. Valuable work was done by Dr. P. W. Cobb of Johns Hopkins University and by M. Luckiesh. In 1913 there was a full-dress discussion on school lighting by the Association of Medical Officers of Schools Association, opened with an excellent paper by Dr. Elwin H. T. Nash, your past president. Then, in 1915, our own Illuminating Engineering Society presented a report of a committee, of which Dr. Kerr was chairman, on the daylight illumination of schools. That was one of the best accounts of the subject.

All these dealt with the subject within the limitations of lighting conditions then existing. It is of interest to note the rapid change in later years as the possibilities of artificial lighting improved. The report of the International Labour Office of the League of Nations in 1923 on the "Protection of Eyesight in Industry" shows how rapid an advance had been secured. Indeed, the qualities of artificial lighting had become so splendid that enthusiasts now arose in the United States of America who put forward the proposition that in ultra-modern buildings daylight might be supplanted by the superior constancy of artificial light!

But in this country there was a growing awakening to the value

of natural light. The architects began to take notice. In 1928 Mr. Percy J. Waldron wrote: "One would expect the architect to be an ardent student of illumination, and to devote more attention to its most perfect and powerful form of sunlight than to artificial light, and to study its more general form of diffused daylight even more than sunlight. Actually, however, the subject of illumination, certainly natural illumination, is, I believe, entirely absent from the curricula of architectural schools, while the knowledge and even the ideas of practising architects on the subject are often extremely hazy and meager."

That this deficiency was being corrected was shown by the "Code of Lighting School Buildings," the joint production in 1924 of American engineers and architects. This is still a valuable code. It was commented upon and extended in a paper by Dr. Kerr at the London Illuminating Engineering Society in 1926. Then there were reports on natural and artificial lighting, issued by a committee of the London Illuminating Engineering Society in 1931, on which there were representative architects, doctors, engineers and teachers. Most significant was the publication of a series of reports by H. M. Stationery Office in 1931–33: *The Illumination Research Technical Papers*, on the seasonal variation of daylight; daylight required in offices; and the penetration of sunlight into buildings. In 1933 the Royal Institute of British Architects issued a report on the orientation of buildings which dealt specifically with schools. By 1937 good lighting had become of such general interest that a London daily newspaper, the *News Chronicle*, instituted a schools' competition, the results of which were published in the *Architectural Journal*. Finally, Parliament has taken a hand in the cause of good lighting. Section 5 of the Factories Act of 1937 demonstrates this. One paragraph reads: "Effective provision shall be made for securing and maintaining sufficient and suitable lighting, whether natural or artificial, in every part of a factory in which persons are working and passing." The fourth report of the Departmental Committee (Home Office) on "Lighting in Factories" is a most valuable document, and might well be studied by all school doctors. Some of its recommendations (iv, v, vi) relating to glare are wholly applicable to school conditions.

Such a sketch as I have given of the history of the growth of the

appreciation of good lighting is not meant to be inclusive. It is meant to show broadly the steps of recent advances. It is meant to show how the work initiated by school doctors for the benefit of the children has spread far and wide so as to include all sections of the community. It is meant to show how the grain of mustard seed grew and waxed into a great tree, all-embracing in its wide circumference. Such a demonstration is of the highest importance to school doctors. Much of their work is of a routine character. But there is always present the possibility of a new idea being generated, when observation and thought are brought to bear upon the work. The school doctor is in truth an educationalist, with an influence far beyond the limits of his schools. The lesson he and his kind taught on school lighting has been learned by the world at large. This is a demonstration of the rôle of education in lighting.

Daylight

Now I propose to sum up some of the conclusions of recent observations upon lighting, especially as these apply to schools.

Daylight must always be of first importance in a school. Artificial light is altogether secondary. Indeed it might be quite practicable educationally to carry on an efficient school without any artificial light. There would be a rule that school work needing reading, writing, or sewing should be done only when there was good daylight, and that when this faded the curriculum should be limited to such lessons as could be given by the voice of the teacher, or to drill, physical exercises, and games. But I take it that with examinations ahead such a rule would be held to be utopian. Nevertheless the point stands. Daylight is the first need for school work, and when that fails close work should be as limited as possible.

"A school should be so placed on a site that no shadow can fall upon the buildings and every available ray of sunshine can play around and enter them." That is a passage from an architects' report. The proposition is quite practicable for country and suburban schools; for town schools it may be impossible. The importance of the statement lies in the fact that the position of the school is the determining factor. Once built, the school and its daylight are fixed. Artificial light we can alter with ease. Struc-

tural alterations are usually prohibitive. The difficulty of the placing of town schools is great. It affects particularly the infants whose eyes are young and tender, and more liable to fatigue than those more grown. The infants must have the lowest floor of a building, for they cannot go up and down stairs easily or safely. The ground floors of town buildings are the worst lighted owing to the nearness of other buildings. There is one way of meeting the difficulty. It is by abolishing the classrooms on the ground and making this into a covered arcaded playground, a most useful provision in bad weather. The approach for the infants to their first floor rooms would be by a ramp. Some day, when lifts are completely safe, the infants will be given the top floor.

The aspect of school buildings is not easy to decide. In winter and spring sunlight in a classroom is pleasant, cheerful, and warming. The idea that by the provision of special glass the sunlight can have other effects is, I believe, fanciful. Glass soon gets dirty, and glass changes its quality, so that special permeability is lost or reduced. Summer sunshine in a classroom is a discomfort. Suitable blinds are hard to obtain, they get out of order, and when they are down the room may be stuffy and dull. The general opinion is that the classroom should have a southeast aspect, so as to get the morning sun, but not much of the midday or afternoon sun. An exception seems desirable in schools on our northeast coast where a south or even a southwest aspect might be comfortable.

Since the majority of our schools must be in or about town, windows should be designed to receive light from possibly limited horizons. The nearer to the ground the floor level of the room, the higher should be the ceiling, and the windows should be carried to the ceiling level. Any blind fittings should be recessed into the ceiling. Transoms and mullions should be reduced to the minimum, and there should be no architectural embellishments in the upper part of the window; Gothic arches and tracery are evils in a classroom. The upper part of the window is the most efficient source of light—screening the top of a window darkens a room far more than the screening of an equal part of the bottom. The windows should be related to the use of the room and not to the exterior elevation. They should be on the left-hand side of the children's

desks and occupy the rear two-thirds of the wall. A sill four feet from the floor is convenient. Windows on both left and right sides are advocated so as to secure free cross-ventilation. With such provision the right-hand windows should be high up and serve as openings rather than lights.

The craze for ultra-modern windows characterized by the broad low fenestration is to my mind wholly bad. It is evident that in towns, rooms with such windows must be dark all day a few feet away from the window, and need artificial light all day and every day. There is much more sense in the tall windows of our eighteenth century houses in Harley Street!

Skylights give more working light than a window of the same glass area. Small skylights give hard contrasts, the angles of the room are dark and gloomy, and the whole effect of the room is prison-like as compared with windowed rooms. Also, unless the glazing of a skylight be doubled, there is a bitterly cold down draught in winter time which is most chilling. Skylights are convenient for art rooms, and even then the factory type of vertical roof lights facing north is preferable.

Clear colorless window glass is best. Plate or thick glass has its value in town as a noise muffler. Where obscured glass is needed, what is known as "cathedral" glass is better than ground or ribbed glass for it can be kept clean.

An "open air school" should theoretically be free of any difficulty about windows. Practically it is not. Shelter is imperative. An open side to a shelter is a window. An absence of glazing may be pleasant in summer; it is not so in winter. The exposure makes ample clothing a necessity. Experience shows that "children are much happier and more responsive when lightly and freely clothed in a room which is healthily warm and draught-protected, adequately but not excessively airy, than they are when heavily clothed in a room with cold air currents." Again, in damp-laden atmosphere there is no certain advantage in all-the-year-round open-air teaching, except to tubercular subjects who would be better provided for in the country. In a book written by a zoologist on an antarctic expedition I found this sentence: "When the fingers are helpless with cold, the mind becomes helpless too."

Large buildings are sometimes planned with what are ironically

called "light-wells." These are outmoded by the recessing of the façades of the buildings, as has been done in the splendid head office of the London Passenger Transport Board in Westminster, and as is being done in the new section of the British Medical Association House.

Outside reflecting surfaces are of doubtful value in town. Just when they might be of most service in the winter time, they become most dirty with the smoke and fog.

Wall Colors

The internal planning and finish of ceiling and walls are of high importance. Rooms should be long on the window side. A useful plan to have in mind is this: each room should comprise a children's square with its left-hand main windows. Extending this is a teacher's annex, lighted so far as daylight from the children's windows; in this part is the teacher's dais and desk, the blackboard, cupboards, maps, and the door. Inevitably the direction of the light is imperfect for the teacher, but he or she is not constantly seated.

Whitewashed ceilings are better than painted. Wall surfaces should be matt finished. The color is important. Here are the findings of reflecting power in percentages: White 84, ivory 77, pearl 73, stone 68, light green 63, buff 60, ivory tan 56, shell pink 51, French grey 40, sky blue 36, tan 28, olive green 21, cocoanut and cardinal red 16, dark green 15. Above a darkish dado a light wall tint is desirable. Tastes will differ. Personally I like ivory white above and a red dado. The combination is fresh and cheerful.

The hall is an integral part of a modern town school. Its natural lighting and its cheerfulness of aspect is of lesser importance than the classrooms. It may well be on the north side of the building, and cheer be given by suitable artificial light and the display of colored pictures.

Artificial Light

Artificial lighting, in recent years at any rate, has been a popular subject of inquiry—not because of its primary importance, for that place is held by daylight—but because of the splendid strides of recent advances in artificial lighting; because of the variety of

its possibilities; and because of the relative ease with which installation changes may be made.

Lamps.—Some village schools still depend upon paraffin lamps, though in England the number is falling with the extension of rural gas and electric services. A central draught spreader paraffin lamp with a well-shaped domed opal glass reflector will give a first-class light. But cleanliness and skill in trimming the wick are imperative; also care is needed for the first few minutes after lighting, for these lamps are liable to flare up and fill the room with soot. Where lamps are in use it is better to use them only for the purpose of general vision, and to exclude close class work for the time; so that the rule for infants' classes should apply in rural schools to all departments.

Gas.—The introduction of the Welsbach mantle revolutionized gas lighting, and the later high-pressure and superheated low-pressure inverted gas burners are as perfect forms of gas lighting as could be desired. The gas mantle has one advantage over the electric filament, in that its intrinsic brilliance is lower; shades and reflectors are therefore more easily adapted. But gas has the disadvantage of its heat and consumption of air. Pendants with opal glass shades whose sides meet at an angle of 80° to 90° form an ample background to the light. There is no need to enclose the mantle. In my opinion it is better to fit a number of separate pendants with one burner each than to group burners within a few large fittings.

Electricity.—The superior convenience and adaptability of electric light, its cleanliness, coolness, and absence of air consumption, are unquestionable. The modern gas-filled (half-watt) lamp is a splendid servant when it is properly mastered, but short of this it is a danger because of its high intrinsic brilliance. One has only to glance for a moment at the naked glowing filament to be painfully convinced of this. Pearl glass bulbs should be the rule everywhere in school and also out of school, unless the bulb be completely enclosed in some sort of globe.

Fittings will differ with the usage of the room. For example, recently at the British Medical Association House I tried out a number of new fittings for new committee rooms and typists' rooms. Some of the modern pancake sort of opal shapes are extravagant in

design, in cost, and in current. These designs seem to aim at the enclosure of as much of the light as possible and to let very little out! In committee rooms the most successful fitment was one known as Holophane Reflector-refractor 14 inch. This has a prismatic dome of 14 inch spread with an incurved gallery below of the same glass with a 6 inch opening or mouth. With a 150 watt pearl lamp the whole forms a pleasant glowing mass which lights up the walls and faces to three to four foot-candles; and the light projected downwards on to the papers and tables measures 12 foot-candles. The lamp is six feet above the table top. Such a light is just what presbyopic committee men appreciate! The bulb is completely hidden, unless you put your head right under the globe.

But this fitting was not appreciated by the typists. They much preferred a simpler and an individual fitting. Each had a pendant bulb enclosed in a bell-shaped glass shade, opal within and green without, 9 inches by 9 inches, suspended 3 feet over the typewriter. There were as many pendants as typists. The big room was suffused with a soft light of greenish hue in contrast to the clear light on the machines. With a 60 watt pearl lamp the light on the keyboard of the machines measures 10 foot-candles.

Indirect or semi-indirect lighting is popular for showrooms and places of social intercourse. It causes much wastage of light; and the bowls are traps for dirt. Where work has to be done there is, in my experience, nothing to equal direct lighting.

The position of points of light in a classroom is of much importance. This is still left too much in the hands of the fitter, so that what he deems proper symmetry is adopted. In my view symmetry is wrong. The placing of points should be as asymmetrical as the windows. I urged this in 1906 and I still urge it. The light points should be sited from the window side of the room so that the children in their desks get their main light from their left-hand side. In a classroom with 20 dual desks of five rows of four each the points would be over the center of the first dual desk on the left hand of the front row, over the third dual desk from the left; and also over the third and fifth rows, making six points to the desks. The teacher should have a standard fitting on the desk with a bell-shaped opaque shade. The blackboard should have a completely screened bracket light.

Our measure of desirable light has changed amazingly in recent years. In the first decade of the century we were fully content with three foot-candles on desks and one foot-candle elsewhere. Now the minimum demands are corridors three, halls seven, notice boards seven, studies 10, gymnasiums 12, blackboards 15, and desks for fine work 15. This superior illumination costs little more than the old poorer light. The whole atmosphere of the school is vastly more cheerful, and so to the advantage of the children.

Associated Matters

There are some other matters worth commenting upon.

Daylight Lamps.—Daylight lamps are quite unnecessary. They waste 60 to 70 per cent of the light. Their sole value is for use where matching of colors must be done at night.

Blackboards—Blackboards of many sorts have been tried. I know of none better than those made of black or blue-black linoleum, suitably framed. This stuff is most pleasant to write or draw upon. Replacement is cheap. It rarely shines; any risk of this can be prevented by canting the board forwards at the top a couple of inches.

Cinema and Lantern Shows.—We are not concerned with the educational values of these demonstrations, only with the lighting effects. Yet I cannot help noting that I prefer the voice of the teacher to a "talkie." I think also the mental impression of a lantern slide, well demonstrated, is more lasting than that of a moving picture. Also that a good diagram or wall picture is better than either of the lantern shows. All lantern shows are trying to young and to sensitive eyes, so that rules are needed. In 1917 I suggested, in what was I think the first paper on the subject, some rules which I think still hold good:

1. There should be reasonable illumination of all parts of the hall not directly beside the screen.
2. Flickering and damaged films should be scrapped.
3. The rate of motion should be as nearly natural as possible.
4. There should be intervals between the shows, with exhibitions other than that of the optical lantern.
5. Shows should be limited to one hour once a week.
6. The seating in relation to the position of the screen should be satisfactory.

Later a committee was appointed by the London Illuminating Engineering Society (at the request of the London County Council) which dealt with the wider question of cinematography display for all sections of the population.

Playgrounds.—The use of these after school hours in the winter demands good lighting. There should be as much flood lighting as possible, and few, if any, deep shadows. Rule iv of the Home Office Report on the Lighting in Factories might well be applied to playgrounds. Altered to apply to playgrounds it would read thus: "Where any source of light is less than 16 feet height above ground level, no part of the source of fitting having a greater brightness than 10 candles per square inch shall be visible to any person while normally within 100 feet of the source, unless the angle of elevation from the eye to the source exceeds 20 degrees."

School and Home.—Finally, we shall all be in agreement that there has been in recent years an immense improvement in our ideas of what natural and artificial lighting for schools should be, even if our practice be not always up to the standard. But a very little investigation into the homes of the children will show that in these there is a wide field for improvement both in ideas and practice. Windows are still cluttered up with draperies. New lamps are put into old fittings without regard to screening. Shop windows in the lesser streets are a painful blaze of naked filaments. The cheaper children's papers are badly printed and on worse paper. So that it may be said that whereas the risks of injury to the children's eyes at school are diminished, the risks of the longer hours at home have increased. There is therefore ample scope for the missionary enterprise of the school doctor to spread from the school into the homes of the people both by precept and example.

The Head and Eye Protection Code of the National Bureau of Standards*

M. G. Lloyd

THE author presents the history, the extent of application, and the effect of the application of the head and eye protection code

THE American Standard Safety Code for the Protection of Heads, Eyes, and Respiratory Organs was issued by the National Bureau of Standards on November 1, 1938, and in December received the approval of the Standards Council of the American Standards Association. It is the third edition of the Code, which formerly covered only protection to the heads and eyes of industrial workers.

Origin of the Code

This Code originated in the work of federal safety engineers during the World War in formulating standards for the protection of the workers in federal establishments. Following the war it was put in the form of a national code, and when the American Standards Association extended the scope of its work to include safety standards, this Code was one of the projects in the first list which received its attention. The National Bureau of Standards has acted as sponsor and publisher of the three editions of this Code and has been assisted in its revision by a sectional committee of 40 members, representing the various interests which are concerned with its particular field.

The extension of the scope of this Code to cover protection to the lungs has increased the coverage and the bulk of the Code, but it

* Presented at the Tenth Annual Convention of the Greater New York Safety Council, March 27, 28, 29, 1939.

is still a comparatively small document of 43 pages. A discussion of the rules, which is issued under the same cover, more than doubles the total length of the published handbook.

The subject of eye protection is covered in the new edition of the Code in substantially the same manner as in the previous edition which has been the standard on this subject for over fifteen years. The operations and processes for which protection is considered necessary are classified in nine groups according to the type of protection which is called for.

Eyes need protection from the impact of flying particles, from dusts, from chemical fumes, from hot splashing metals, and from injurious radiation.

Flying Particles

For protection against impact, both lenses and frames must be strong enough to resist shock and withstand hard usage. Processes which involve this hazard include chipping, caulking, and some riveting operations. Side shields are usually desirable; or the eye-cup type of goggle may be employed. Where the particles are small and in the nature of dust, such as in grinding work, strength of construction is not important and a lighter type of goggle may be used, although the chippers' goggle is entirely suitable for this purpose also. Where the dust is such as exists in the atmosphere, the same remarks apply and almost any type of goggle will accomplish the purpose. An example of this group is automobile driving without protection of a wind-shield.

Splashing Metal or Chemicals

The hazard of splashing metal is exemplified in such operations as babbitting and casting hot metal. In this work the goggle lens must be able to resist the heat of metal which may be splashing against it, but strength in the frames is not required. In the case of splashing chemical liquids or fumes, the goggle frames should make a tight contact with the face and the goggles used for this work should not have any ventilating openings such as are generally desirable in goggles for other purposes in order to further the comfort of the wearer and to prevent the fogging of the lens.

Abrasive Blasting

Abrasive blasting represents an occupation where not only the eye but the face must be protected from the impact of flying particles, and where the lungs must also be protected from the inhalation of dust. Goggles alone, consequently, are not sufficient for the purpose and a helmet or hood which covers the entire head is needed for such work.

Injurious Radiant Energy

The remaining three groups which have to do with eye protection are those which involve injurious radiant energy. If such radiant energy involves little or no ultraviolet light but merely high intensity of visible light, almost any goggle lens which cuts down intensity of the light will answer the purpose. The spectral transmission in this case is of little importance. If, on the other hand, injurious ultraviolet light is encountered, as in gas and electric welding, it is not sufficient to reduce visible light to a comfortable value, but care must be taken to cut off also the ultraviolet rays which are invisible but which are capable of causing serious injury.

Standardization of Shade Numbers.—The ability of goggle lenses and helmet windows to absorb light is usually indicated by the assignment of a shade number to the particular glass in question. Not so many years ago, each manufacturer of absorptive glass assigned his own shade numbers to his product and there was no assurance that a given shade number as obtained from one source would be the same in its properties as a glass from some other source carrying the same shade number. It is only within the past decade that the use of shade numbers has been standardized, and the new edition contains a table of properties which define the scale of shade numbers. This is the result of work which was carried out by the National Bureau of Standards and first utilized in the federal purchase specifications for goggles and welding helmets.

According to this scheme of standardization, the shade number has a definite relation to the density and also to the optical transmission of the glass. The density and shade number are connected by the formula, density = 3/7 (shade number minus one). The density is also connected to the optical transmission by being defined as "the logarithm to the base 10 of the reciprocal of the

transmission." Thus a glass of shade No. 8 has a density equal to 3, and as 3 is the logarithm of 1,000, the optical transmission of glass of shade No. 8 is .001, or one-tenth of one per cent.

The choice of a proper shade number for welding, or similar work, is partly a matter of personal choice, since some eyes are more sensitive to light than others. In general, the high shade numbers, such as 10, 12, and 14, are suitable for arc welding and cutting of different intensities, whereas shade Nos. 5, 6, and 8 are more suitable for gas cutting and welding. Shade Nos. 3 and 4 are not sufficiently dense for welding work but are suitable for cutting down the glare in furnace work, metal pouring, and outdoor work where sunlight may be reflected from the snow, from white sand, or from water. In all these cases, however, it is important that the ultraviolet light which is always present in sunlight, and present in larger quantities in radiations from intense electric arcs, should be held down to a very low value.

Corrective Lenses

The problem of giving proper protection to the eyes of workmen who must wear corrective spectacles has at times been a troublesome one. In the early days the best solution appeared to be to grind the lenses of protective goggles so as to give proper eye correction. With the development of goggle frames which can be worn over the corrective spectacles, we have an easy method for taking care of this situation, and in recent years there have also appeared on the market goggle frames which incorporate corrective lenses mounted inside of the protective lenses. This problem should, consequently, give no further trouble.

Proper Fitting and Sterilization of Goggles

To prevent accidents to the eye, it is not only necessary to have suitable goggles available, but it is necessary that they can be worn with reasonable comfort, or, experience indicates, they will not be worn when needed. The fitting of goggles to the individual wearer is consequently a matter of great importance. An occasional inspection to see that the fit is maintained and that lenses of goggles which have suffered damage are replaced, is a prime requisite in the fulfilment of eye protection. The Code consequently contains a

section of operating rules dealing with the proper fitting of protectors, the replacement of defective protectors, and the sterilization of goggles and other protectors after they have been worn by one worker before they are assigned to another. Various methods of sterilization are recognized, some of which are more appropriate for a particular type of protector, and some for another.

A final section in the Code deals with the necessary tests to insure that goggles and other protectors are suitable for their purposes. These tests involve mechanical strength of both lenses and frames in the case of chippers' goggles; a test for corrosion to see that frames will remain suitable for wear; optical tests for lenses and helmet windows which are to be used for welding and similar work; and various tests for equipment intended for protection of the head and lungs.

Safety Code's Uses

It should be recognized that the Safety Code aims to give the essential qualities of protective devices which are necessary to protect the wearer from the various hazards which have been considered, but the Code is not a complete purchase specification and does not cover anything but the minimum essentials for a protective device. Other considerations enter into the choice of a device for purchase and individual use, but in making purchases the customer should always insist at least on compliance with the American Standard Code. For those who desire further guidance in making purchases, reference may be made to a series of federal specifications which have been prepared for the purchase of goggles and helmets by the federal Government for the use of its own employees. These specifications can be obtained from the Superintendent of Documents in Washington, D. C., and will only be mentioned here.

GGG-G-501:	Goggles; eyecup, chippers'.
GGG-G-511:	Goggles; protective (glare and welders').
GGG-G-521:	Goggles; rubber-frame.
GGG-H-171:	Helmets; babbitting.
GGG-H-201:	Helmets and masks; for abrasive-cleaning.
GGG-H-211:	Helmets and shields for welding.

While the Code offers a recognized standard for adoption by regulatory authorities where mandatory rules are deemed desirable, the greatest use of the Code will no doubt be found to be by manufacturers and users of protective equipment. By meeting Code requirements the manufacturer may be confident that his product will meet the needs of industry.

It is the user of protective equipment, however, who usually approaches the problem with less specialized knowledge of conditions and who is consequently in need of such guidance as can be found in the Code. His first problem is to decide whether protective equipment is needed. If the operation in question is one which typically calls for protective equipment, the Code will make this clear.

After the need for a protective device has been settled, the Code will give the necessary guidance as to the type of device which should be obtained, and then purchases should be restricted to firms which guarantee their products to comply with Code requirements. If further proof of such compliance is desired, or in any purchases involving large quantities, representative samples of the equipment delivered may be tested by the purchaser if he has the necessary testing facilities, or by a qualified testing laboratory if those facilities are not at hand. Some of the tests specified in the Code can be carried out with very simple equipment, such as the drop test for strength of goggle lenses. Other tests call for special equipment and trained personnel, such as those for the ultraviolet transmission of welders' glasses.

Frequency of Eye Accidents

Nearly all of the eye accidents reported are of a mechanical nature, and the number indicates that existing hazards to the eye are frequently not realized by shop managers. A national survey made by the National Society for the Prevention of Blindness a decade ago showed that about 200,000 eye accidents were occurring in industry each year, and that except for fatal accidents they surpassed all others in seriousness and expense.

In New York State, in 1935, 1,618 compensable eye accidents were reported. Two of these resulted in death and nine in total disability. There were 435 cases of permanent partial disability,

usually represented by the loss of sight in one eye. The total amount of compensation was $927,625. In 1937 there were 1,979 compensable eye injuries, costing $1,121,000. I do not have figures for 1938 but in most years the compensation cost has exceeded a million dollars. Prevention continues to be a serious problem.

In plants which have supplied goggles systematically to their workers, thousands of employees have had their eyes saved. In one group of such plants one employee out of each 156 had an eye saved each year, but too frequently the hazards go without attention until after an accident occurs.

Compensation for the results of harmful radiation does not loom so large, because goggles or helmets are almost invariably used in welding and similar work; and even when the eye is injured, the effect is not realized until later, and the injury is usually only temporary, although cases of blindness from this cause have been reported. The great problem in eye protection is to get the worker to wear the protective device. As this phase of the problem is to be covered by another of your speakers, I shall not attempt to deal with it.

Fifteen Years' Progress in Eyesight Conservation in Industry*

Louis Resnick

"THERE is certainly no need for the blinding of any worker in American industry," says the author, after years of observation of industrial conditions. Advances, remaining problems, cost of industrial accidents, and recommendations are discussed in this brief article

Advances

First among the many respects in which progress has been made in eyesight conservation in industry during the past 15 years I would place the fact that there are in the industries of America today far fewer amateur shop oculists—the kind who use toothpicks, matches, pocket knives, files, screwdrivers, and other infection-bearing instruments in their efforts to remove particles from the eyes of injured fellow workers. I cite this bit of progress first because of the tremendous damage done to eyes of industrial workers, in the past, by crude and bungling first-aid.

There are fewer of these amateur shop oculists because of the greater appreciation by workmen and by management of the importance of avoiding infection in even the most minor eye injury and because there are now far more first-aid rooms with doctors or nurses in charge in industrial properties than was true 15 years ago. Whereas 15 years ago the full-time industrial physicians of the country might almost have been counted on the fingers of one man's hands, today the American Medical Directory records 345 doctors who are limiting their work to industrial medicine, and a thousand others who report industrial practice as their special interest.

* Presented at the Tenth Annual Convention of the Greater New York Safety Council, March 27, 28, 29, 1939.

That there is still far to go in this respect is indicated by the fact —brought out at the First Annual Congress on Industrial Health recently held in Chicago—that the bulk of medical service to men and women injured in industry is rendered by general practitioners, many of whom, of course, have little knowledge of conditions in industry which lead to the injuries or industrial diseases they are called on to treat. This lack of information about the industrial conditions often handicaps the doctor in diagnosing or treating an industrial patient and certainly limits his ability to tell the patient or his employer how best to protect the worker's health on his return to employment. There is great need for bringing to general practitioners of medicine throughout the country, and particularly in industrial areas, more information about the accident and health hazards of industry. This, the National Society for the Prevention of Blindness proposes to do with respect to the accident and disease hazards affecting the eyes.

Great progress has been made in the past 15 years in the elimination of accident and disease hazards affecting the eyes through ventilation, exhaust systems, and air conditioning. Greater use of exhaust systems to draw off poisonous gases and dangerous dusts has saved thousands of workmen from daily exposure to working conditions which eventually, and often suddenly, result in seriously impaired vision, if not total blindness. Incidentally, ventilation, air-conditioning and exhaust systems installed for this purpose more than pay for themselves through the increased efficiency of the workers they protect, to say nothing of lowered workmen's compensation costs.

Industrial Lighting.—Great progress has been made in the past 15 years in industrial lighting which, like ventilation, has both increased the efficiency of employees and conserved their sight. While it is true we cannot point to particular individuals who have become blind through working under poor lighting conditions, we have evidence, developed in recent years, of the direct relation between bad lighting and bad eyesight. I refer to a study made by the United States Public Health Service of the relation of good lighting to occupational efficiency as demonstrated in two New York City Post Offices—one modern and well illuminated, the other old and with inadequate lighting.

The 2,400 employees studied in these post offices were comparable in their age distribution, in years of service in the post offices, and in the nature of their work. The prevalence of defects and diseases of the eye was found to be much greater in the poorly illuminated post office than in the well lighted post office.

The percentage of employees with normal vision in both eyes and with no defects was twice as great in the well lighted post office as in the poorly lighted office. In the well lighted office, 32 per cent of the workers were found to have defective vision in both eyes as against 42 per cent of the workers in the poorly lighted office. In the well lighted post office, 12 per cent were found to have inflammatory conditions of the eyes, and in the poorly lighted post office, 21 per cent had such conditions. In the well lighted post office, 22 per cent of the workers had muscular unbalance of the eyes, and in the badly lighted building, 33 per cent had muscular unbalance.

Most significant was the revelation that in the poorly lighted post office three times as many employees were subject to asthenopia—a weakness or rapid fatigue of the eyes often accompanied by pain and headache—as in the well illuminated post office. What was true in these two post offices is undoubtedly true throughout industry.

Ophthalmology and Industry.—In the field of ophthalmology great strides have been made in the treatment of eye injuries and diseases. I shall not attempt to describe this progress except for one of its most spectacular aspects.

Some of you may recall that the edition of *Eye Hazards in Industrial Occupations* which appeared fifteen years ago opened with the statement: "No one has yet produced an artificial eye that can see; nor does anyone dare predict that the day will ever come when it will be possible to replace the human eye with an artificial eye that will see." This is still true, but something almost as miraculous as an artificial eye that can see has happened during the intervening 15 years. That something has been mistakenly referred to in newspaper and magazine articles as "the transplanting of human eyes." Successful transplantation of a whole eye has never been accomplished. What actually has happened has been the transplanting of small segments of eye tissue—an operation

which has restored considerable sight to some who had little vision left and has saved others from impending blindness. More than 100 such operations have been performed in one New York hospital, many of them with good results.

Less spectacular but even more effective procedures for saving the eyes of workmen, after slivers of steel have pierced their eyes, have been developed in the past 15 years and treatment of industrial eye injuries of various sorts has been greatly improved in the past decade or two. I shall leave details of these to the medical profession.

Vision Testing in Industry.—The discovery and the correction of defective vision among employees also has seen great progress in American industry during the past 15 years. More plants have pre-employment examinations and follow-up eye examinations; the quality of eye examinations in industry has greatly improved. Plants which 15 years ago were content to have an employment clerk test vision by a chart and end the eye examination there, now recognize the desirability of having an ophthalmologist examine the eyes of every worker before he is put on the payroll and periodically thereafter.

Despite all the progress in this direction there is still the need of reminding management of industry that poor vision—whether due to insufficient light or to uncorrected eye defects—is one of the principal causes of fatigue, not only of the eyes but of the entire body. Employers and their supervisors and safety engineers should recall the words of Frank Gilbreth, one of the earliest students of fatigue in industry, who said, "No fatigue is more wearing than eye fatigue."

Safety Education in Industry.—Marked progress has been made in the education of workers and management as to the wearing of goggles. Fifteen years ago, few employers were willing even to ask such workers as carpenters or painters to wear goggles. Today, in at least one big company, The Pullman Company, where almost every trade and craft is represented, every employee, every foreman and superintendent, and every visitor is required to and does wear goggles all the time they are in the plant. I do not know of any other company with such a record of 100 per cent eye protection, but it is clear as I go through shops and factories this year that

there is far more widespread and more consistent wearing of goggles than ever before.

The progress that has been made in this direction is, however, still merely a beginning. There is no reason why every industrial property should not be able to do what The Pullman Company has done. If every industrial plant did require all employees and visitors to wear goggles and succeeded in getting the high percentage of observance The Pullman Company does for this rule, the bulk of the $10,000,000 paid as compensation for eye injuries in American industries each year would be saved; hundreds of workers would be saved from blindness each year; and thousands more would be saved from serious eye injuries which, while not producing blindness, leave them with vision in only one eye or with very limited vision in both eyes.

Factory Inspection.—Great progress has been made in training factory inspectors, both insurance and state government inspectors. Fifteen years ago it was a commonly voiced opinion that the average safety inspector, whether he worked for a state department or an insurance company, could have little influence with management except through his reporting of safety code violations, and even that part of his work was done by rote. Today, more and more safety inspectors are genuine experts in the detection and control or elimination of accident and health hazards in industry. The United States Department of Labor has assumed leadership in the training of state safety inspectors and the insurance companies have done much to make their inspectors safety engineers rather than mere field clerks or reporters. The importance of all this lies in the fact that in the last analysis the battle for safety is carried on by the safety inspector. He is on the firing line, and in the thousands upon thousands of plants too small or too backward to employ a safety engineer it is the safety inspector—whether he be a state inspector or an insurance inspector—who has the opportunity to put vitality into the safety program or to allow it to lapse into a mere paper program.

Some Remaining Problems

Now let's look at the other side of the scale. At this late date, after 25 years of safety campaigns, there is still to be found in some

plants the bad practice of hanging a pair of goggles on a nail beside the grinding wheel for the use of all men who may have occasion to work at the wheel. The tremendous progress that has been made in the design, manufacture, and promotion of goggles, and in education as to their use, is reflected in the fact that the lone pair of dust-accumulating goggles on a nail or in a cigar box over the emery wheel is a rapidly disappearing institution.

Eye Infections.—Almost as much can be said for the common towel, an even greater carrier of eye disease than the common pair of goggles. The roller towel was long ago legislated out of existence, and general sanitary conditions in most work places have been greatly improved. But there still are hundreds of thousands of industrial workers for whom no clean wash rooms, no clean towels, are available. So long as such conditions exist, workers are being exposed to a variety of contagious diseases, some of which may seriously affect their sight—and their employers' compensation costs.

There is another most important hazard to sight in which it is not clear—at least to me—whether we have made great progress or great backward strides in the past 15 years. I refer to the field of industrial poisons. Fifteen years ago, when the second edition of *Eye Hazards in Industrial Occupations* was published, it listed 22 industrial poisons, use of which presented hazards to the eyes. In the forthcoming third edition the list of industrial poisons involving hazards to the eyes has grown from 22 to 50. Both lists were taken from the best concise authority on the subject—a bulletin prepared by Louis I. Dublin and Robert J. Vane, published by the United States Department of Labor.

Industrial Poisons.—Whether this represents progress in greater recognition of the dangers involved in the handling of poisons which were used 15 years ago as well as today or the reverse of progress through the introduction of new poisons injurious to the eyes, is not clear; it probably represents both.

Of this we can be sure: the growing use of poisonous chemicals in industry now presents one of the most serious hazards to the eyes of workers. This hazard is aggravated by the fact that thousands of men and women who are working with these poisons are wholly unaware of that fact, wholly unaware of the disease hazards

to which they are exposed, and unaware of the steps they should take to guard against the harmful effects of these poisons. This is so because in many plants the poisonous chemical mixtures are trade secrets known to most of the persons who handle them only by some such symbol as Solution B3 or Solution C4, the precise make-up of the solution being known to perhaps only one or two persons in the plant.

As industry comes to be held responsible more and more for the effects of these poisons through their designation as compensable occupational disease hazards, the more progressive employers will use every known means to protect the workers exposed to these poisons. Meanwhile, it is the responsibility of every safety engineer, of every physician or surgeon having any industrial practice, and of every industrial nurse, to become familiar with all the poisonous substances used in their respective plants and to take all possible steps to protect the employees who are exposed to these poisons.

Cost of Industrial Eye Accidents

Despite all the progress already made—and it has been great progress—employers and employees of American industry are losing $50,000,000 a year as the result of preventable eye injuries, and the blind population of the country is being needlessly increased each year as a result of accidental injuries to the eyes. The loss to industry and its workers in New York State from this cause is in the neighborhood of $5,000,000 a year, of which approximately $1,000,000 represents compensation paid to workers for eye injuries and $4,000,000 represents indirect loss to industry and the loss in the worker's earning capacity.

In the last 10 years a total of more than 18,000 men and women in New York State have suffered permanent, partial, or total loss of vision as a result of occupational accidents or diseases, and employers in this State have during these 10 years paid more than $12,000,000 in compensation to these 18,000 blinded or partially blinded workers. The indirect loss to these injured workers and their employers was probably four times as great as the direct loss as measured in compensation paid.

Practically all this loss, and the human suffering resulting from

the blinding of industrial workers, could be averted by thoroughgoing co-operation of employer and employee in the utilization of demonstrated methods of preventing accidents and diseases. Not only would these losses be averted, but the efficiency and earnings of workers and employers would be substantially increased if both groups throughout industry did what is being done successfully in a few plants in America to prevent eye injuries.

Twenty years' observation of conditions in industry has convinced me that accidents are not inherent in industry, that they are almost 100 per cent preventable, and that the dividends on investments in accident prevention are sometimes greater than the dividends on the primary business of an industry. There is certainly no need for the blinding of any worker in American industry. The industrial accident and disease hazards affecting the eyes are now commonly known; methods of eliminating these hazards or of protecting workers against them have been thoroughly demonstrated; devices which provide protection against almost every type of eye accident are now available.

Some concerns have succeeded in reducing the frequency of eye injuries to the point where the blinding of a worker in their plants has become a rare instead of a commonplace occurrence. The accident prevention methods used by these corporations successfully have been widely reported by the National Society for the Prevention of Blindness, the National Safety Council, and by other interested organizations. In view of these facts and of the high cost of industrial accidents, it is a sheer waste of human and financial resources to continue exposing workers to industrial eye hazards.

Recommendations

Four things are necessary, however, before any industrial property can attain the goal of 100 per cent eye protection for its employees. They are:

1. A clear-cut and continuous demonstration by management that it is as much interested in accident prevention as in the manufacture and distribution of its particular commodities; without such a demonstration, management cannot hope to secure the complete co-operation of employee.

2. Thorough-going mechanical safeguarding of all hazardous operations, including provision of goggles, headmasks, and other eye protective devices, and *a mandatory rule requiring their use by every worker, supervisor, and visitor anywhere in the plant.*

3. A thorough-going, continuous program of safety education of workers and their supervisors.

4. Continuous and conscientious co-operation of employees with management in observance of safe practices.

Industrial Eye Protection Program: How Is It Set Up? How Is It Put Across? How Is It Kept Across?*

Harry Guilbert

THE safety man must be 100 per cent sold on the necessity for eye protection in order to carry out a thorough-going program. Mr. Guilbert presents the economic as well as the humanitarian arguments for making the use of goggles in a plant a mandatory rule of employment

How Is It Set Up?

Naturally the Safety Man must be 100 per cent sold on the necessity of eye protection. There is absolutely no use in trying to sell someone something that you yourself do not believe in. If anything needs sincerity, certainly it is a campaign to conserve vision in industry.

The next step is to "sell" management. The approach may be from one or all of the following angles:

Economic.—Comparing the cost of compensation for eye losses with the cost of goggles presents a convincing argument in favor of the latter. The Pullman Company's investment in sight protection has returned tremendous dividends, not only in cash but also in increased production and goodwill.

Increased Efficiency.—Goggles instill confidence in the wearer because he realizes that his eyes are safe. Hundreds of men have told me they would rather work without their shoes than without goggles because they fully realize the protection which goggles afford.

* Presented at the Tenth Annual Convention of the Greater New York Safety Council, March 27, 28, 29, 1939.

Humanitarian.—It has been well said that the eyes are the windows of the soul. Man's sight is his greatest asset. There is no substitute. Although a glass eye is an artistic piece of work, it is more ornamental than useful, and—as I said many years ago—you can't see through one.

One-eyed men are not generally being hired in industry today. Management must certainly assume some responsibility for the welfare of its men so that they will not become public charges.

When management has been sold on the value of an eye protection program, the next step is to conduct an intensive survey of the plant to ascertain just what the situation is and how you are to maintain your program. Have your industrial engineer accompany you. The survey should point out:

1. The type of goggle best suited for general use.

2. Types of goggles required for special jobs, such as welding, acid handling, dusty occupations, etc.

3. The number of prescription goggles needed. If you have not already done so, have the eyes of every employee tested; those wearing corrective glasses should be immediately equipped with goggles containing prescription lenses.

4. The cost. It might be well to give the management the estimated cost of the entire plan and arrange for a budget.

How Is It Put Across?

There is only one way to do this, namely, by means of a mandatory rule. There can be no exceptions whatever to that rule. At the entrance to each of our plants there is a sign, over the signature of the president of The Pullman Company, requiring everyone entering that plant to wear goggles. Occasionally some "wise guy" tries to gain admittance without complying, but the watchman never argues—he merely points to the sign.

The eye protection program can be put across by example, education, and the provision of comfortable goggles.

Example.—Every supervisor in the plant from the manager down must wear goggles every minute while he is in the plant. What type of foreman would ask a man to wear goggles while exposing himself to danger by not wearing them?

No leader worthy of the name would ask his men to perform some act that he is not willing to do himself. "Example is better than precept."

Education.—Explain to the worker the value of the human eye. For example, have him close one eye and then attempt to see his normal field of vision. Ask him to try to cross the street through traffic with only one eye open. Total loss of vision is easily demonstrated by having the man close both eyes and walk around a familiar room.

Provision of Comfortable Goggles.—Goggles must be comfortable and afford the maximum eye protection. It is important that every pair of goggles be properly fitted to the individual wearer. For obvious reasons this is just as mandatory as the rule pertaining to the wearing of goggles.

Every man with defective vision should be provided with goggles containing prescription lenses. Until his special goggles arrive, the worker should be furnished with cover-all goggles which can be worn over corrective glasses. Of course, the best goggle that money can buy should be distributed to each employee free of charge. The purchasing agent should have nothing whatever to do with this matter because the average one knows nothing about this complicated subject.

Don't forget to furnish a metal case with each pair of goggles. This is a splendid investment for obvious reasons.

A convenient repair service should be maintained in each plant. Daily check-ups should be conducted by supervisors and safety men in order to make certain that goggles are kept properly adjusted which is tremendously important.

How Is It Kept Across?

If the foregoing is strictly adhered to, an industrial eye protection program will take care of itself. Of course, firm supervision is vital. Compromise must not be tolerated. Occasionally, disciplinary action is necessary and in such a case, the individual concerned will be no loss to the company because anyone who would object to conserving his most precious possession would hardly be considered well balanced.

Display boards exhibiting goggles broken in service, together

with the name of the wearer and an outline of how the accident occurred, have proved beneficial. In maintaining the interest of the workers, suitable bulletins may be posted to good advantage. These and a host of other things are helpful, but there is no substitute for the mandatory rule. Until it is universally adopted in industry, thousands of eyes will be unnecessarily destroyed annually.

Some Random Thoughts

Who is immune to an eye accident? Of course, this is a foolish question to ask a group of intelligent people, but upon scores of occasions I have heard thoughtless, impractical people tell me where goggles should be worn in the plant and where they are not necessary. One of the reasons that eye protection has not made greater strides in industry is that many, many people who know very little, if anything, about the subject are stating very definitely what should be done about it.

Another reason why thousands of eyes are being destroyed in industry is that it requires a great deal of concentrated work and determined effort to bring any eye protection program to a successful issue. Most people sidestep hard work. Today in America there are hundreds of unfortunates getting along with one eye who would still have two eyes if the apathetic attitude of management and of some safety men had been dispelled years ago. Inertia—which is prevalent in the human race—has also played a material part in causing blindness, partial and total.

Personally, I have never had a workman tell me that he would not wear goggles, but managers, department heads, and foremen have told me that not under any circumstances would they be "annoyed" by them (as they put it).

This is practically a virgin field in industry today, and I should like to be turned loose in it with nothing else to do except sell workmen on the idea of eye protection.

Summary

1. Mandatory rule should be a condition of employment.
2. Great care should be exercised in distribution.
3. Intelligence should be used in selecting types.

4. Maintenance of goggles, consisting of adjustment, repairs, and sterilization, is important from an economic standpoint and is a service to which the men are entitled.
5. Tests to portray the strength of the lenses should be made before groups of men.
6. Complaints:
   a. Weight of goggles—There are 28.35 grams in an ounce, and 453.6 grams in a pound.
      Weight of a pair of corrective glasses—23.1 grams (which is less than an ounce).
      Weight of spectacle type goggles—50 grams.
      Weight of goggles with side screens—53.7 grams.
      Weight of cup type goggles—70.7 grams.
      A man's tie weighs 22 grams.
   b. Fogging—A small amount of Ivory soap rubbed on both sides of the lenses and polished with a dry cloth will remedy this.
   c. "They look funny." A one-eyed man looks funnier.
   d. "They hurt my eyes." Perhaps you should have an eye test.
   e. "They give me a headache." So does a new tarpaper kelly.
   f. "Side-screens obstruct my vision." Give a demonstration with a newspaper.

Modern Conception of Conservation of Vision*

Conrad Berens, M.D.

THE author presents a popular article on some common problems of eye hygiene from youth through old age

MAGIC and miracles, which in bygone days were said to restore sight, have been superseded by a new knowledge of the conservation of sight and by efforts to keep the eyes at their highest degree of efficiency. The layman, because he acquires from 80 to 90 per cent of his knowledge through his eyes, usually thinks of them in terms of what they bring him from the outside in knowledge, interest, or beauty. But for the eye physician the approach is reversed and he thinks in terms of what examination of the interior of the eye teaches him concerning the patient; for example, hereditary conditions, development, past illnesses, and present diseases. The physician no longer considers the eye an isolated organ but realizes that approximately 60 per cent of his patients show symptoms in their eyes which indicate trouble elsewhere in the body. By means of the ophthalmoscope the eye physician is able to examine the interior of the eye and thus often is the first to discover the evidence of serious diseases of the brain, the blood, the digestive tract, kidneys, heart, or arteries. This is an excellent reason for having the eyes examined periodically by an eye physician, that is, by one with the degree of M.D., who has had special training in diseases of the eyes.

General Considerations

Do you realize that efforts to prevent eye diseases and blindness should, and often do, begin before birth? Before parents consider

* Radio Address, WNYC, Thursday, December 22, 1938, under auspices of Radio Committee of the Medical Society of the County of New York.

having children, they should be certain that they have no hereditary transmissible disease. Congenital and hereditary defects are the cause of blindness in 51 per cent of the children in schools for the blind in the United States. The expectant mother, therefore, should be examined for evidence of syphilis or gonorrhea. If either of these diseases is present, she should receive treatment which may prevent infection of the baby's eyes. Since inflammation of the eyes of the newborn is a preventable disease, the proper care of the birth canal, the necessity of improving the treatment of gonorrhea in clinics, and the use of prophylactic stations should be stressed. Drops of silver nitrate used in the eyes of the newborn child also aid in the prevention of blindness. The National Society for the Prevention of Blindness and similar organizations have been active in disseminating information concerning prenatal and postnatal precautions. This has resulted in a diminution in the number of children blind from gonorrhea and syphilis.

Parents may protect the eyesight of the family by providing sanitary conditions and by educating their children in the prevention of eye infection from contaminated towels, dirty hands, and unclean objects. By prohibiting the use of toys with sharp points, and explosives, such as fireworks and firearms, as unsuitable playthings for children, parents can prevent many eye tragedies. In the schools and classes for the blind in the United States it was found that there are 500 children whose blindness is caused by accidents. Because it is estimated that this number is annually increased by 70, those who are responsible for the guidance of children should aid in the movement to prevent these unnecessary injuries.

The wise parent will also obtain reliable information regarding the influence of diet on eye health and eyesight, and will be on the alert for any eye inflammation or condition of vision which requires professional attention.

Crossed Eyes

If children show evidence of having crossed eyes, they should be examined to determine the cause—whether it is a disease of the eye, a need for glasses, a serious disease of the brain, or one of many other causes. Even though the eye is not diseased, if it is per-

mitted to turn in or out without training the sight, it may gradually become partially blind from lack of use.

Preschool Eye Examinations

The eyes of children should be examined a year or two before they enter school so that visual or muscular troubles may be found and corrected without interfering with school work. Poor vision and faulty co-ordination of the eyes may cause a child to be dilatory in his studies and emotionally upset.

Reading Difficulties

Much interest has been aroused in the past few years concerning so-called reading difficulties. It has been stated that reading difficulties are increasing because it has been estimated that 15 per cent of the children in our public schools are so handicapped. However, it is probably closer to the truth to think that more attention is being paid to the physically handicapped child. Therefore, because more thought is given to this subject, more reasons are being discovered for inability of the individual satisfactorily to perform the work of the average student.

There is no doubt that today, and especially in the past, many children were considered to be lacking in intelligence, when in reality they were suffering from some physical handicap or defect in training which prevented them from acquiring knowledge through reading.

As a matter of fact, many of the children who have so-called reading difficulties are above the average in intelligence when examined by accepted psychologic tests. Children with reading difficulties should be examined by an eye physician for defective vision and especially for anomalies which prevent the proper co-ordination of the eyes.

This examination should include a test for inequality of the size of images seen by the eyes and the eyes may be photographed on a moving film to give the ophthalmologist an idea of how the eyes move while reading. This is only part of the study which should be supplemented by a physical examination and by a psychologic examination.

Sight-Saving Classes

When children enter school, the effort to save eyesight is one of co-operation between the home and the school; it is a wise plan to perform a routine examination of the eyes of school children at least once a year. In this way, the early stages of any eye disease or beginning disturbance of sight may be discovered. If sight is seriously impaired, the remaining vision should be safeguarded by placing these children in sight conservation classes where they will use books and typewriters with large print and where illumination will be adequate. At present only 6,000 of the 50,000 children who need this service are receiving it. In many places there are no facilities for continuing the education of the partially-seeing in high schools and colleges, and the partially-sighted pupils of high school and college age either discontinue their studies or possibly continue them to the detriment of their vision.

A study of the causes of blindness in children showed that in many cases eyesight could be saved if the children had received thorough eye examinations and proper treatment. This investigation also revealed that many children classified as blind could be educated in classes for the partially seeing and sometimes in those for children with normal eyes.

Eye Injuries

Education of industrialists and workers has proved effective in promoting the compulsory use of goggles and other protective devices, thus reducing partial or total blindness resulting from industrial injuries. In order to appreciate the importance of such education everyone should see a group of patients partially or totally blinded through carelessness.

Focal Infection

The eyes may be diseased by the extension of inflammation from adjoining tissues, such as the nasal sinuses. The so-called focal infections, in which the poison center is found in a decayed tooth, in an abscess at the root of a tooth, in diseased tonsils, and probably even in the appendix, gall-bladder, or intestinal tract, may also be

associated with disease of the eye. The maintenance of good health thus seems to be a valuable safeguard for preserving eyesight.

Headache and Glasses

A word of caution concerning headaches and glasses is needed because too many people believe that headaches are caused primarily by eyestrain and that glasses will cure them. It is well known by physicians that the eyes are not the sole cause of headaches and that glasses will relieve only some of the eye headaches. Certain headaches, even though benefited by glasses, also require general medical treatment and eye exercises. The layman should remember that diseases of the sinuses and other conditions, for example, disorder of digestion, kidney disease, high blood pressure, brain lesions, and many other conditions, may produce headache which, of course, will not be cured by glasses.

Glasses do not change the structure of the eye: they assist the eyes to do the work they are unable to accomplish without glasses. The condition of the general health has a very important effect on the eyes.

Cataract

Environment may affect the eyes. For example, intense heat may cause the lens to become opaque, that is, a cataract may form. Inflammations are often associated with one form of cataract and the patient should be thoroughly examined in order to eliminate nasal disease and other focal infections. Many people fear cataract, but it is one of the least serious conditions which may cause loss of sight because if the cataract becomes sufficiently dense it may be removed by operation. Patients are usually informed that if a cataract is removed from one eye, the eyes will not function together; however, the eyes of some patients may be made to coordinate sufficiently with special glasses or eye exercises so that the discomfort caused by double vision is lessened. In spite of much advertising to the contrary there are no cures, other than surgical, which will clear away a well-developed cataract. But the progress of lens changes sometimes seems to be arrested by adequate care of the general health—for example, proper treatment of diabetes,

possibly diet containing proper vitamins, and also protection of the eyes from intense heat.

Glaucoma

When the tension or pressure within the eyeball is increased, glaucoma or hardening of the eyeball exists. Eyesight sometimes may be saved through continued eye and medical treatment. Treatment for glaucoma may consist in proper diet, sufficient sleep, exercise, elimination of waste products of the body, as by sweat baths, and by the continuous use of drugs in the form of eye drops. Surgical treatment is not always markedly successful. Much depends upon whether operation is performed early in the disease when advised by the eye surgeon. Disease in other parts of the body must be eliminated. Too frequently worry is also a factor in these cases of glaucoma.

Social Service and Follow-up Work

Social service and follow-up work in our clinics, and the co-operation of the physician and the social worker in treating patients, may prevent much unnecessary blindness. The social worker can investigate the patient's environment, for malnutrition and lack of cleanliness in the home may lay the foundation for many diseases of the eye. She can also see that the patient has sufficient illumination in the home. She can be instrumental in urging continuous treatment, when necessary, and through her personal contact with the patient and the community, can bring about an adjustment of the various problems which might be contributing to the eye condition.

Illumination

Under proper conditions a healthy eye in a healthy body is difficult to tire. What are the proper conditions? First, the vision should be corrected by glasses if they are required; and if eye muscular disorders are present, they should be treated by eye exercises or operation. The factor next in importance is adequate light, which varies according to the task to be accomplished. Avoidance of glare also aids vision and ocular comfort. Proper illumination is especially important if the eyes are defective or diseased.

It has been demonstrated that excessive use of the eyes, especially if they are defective, may cause spasm of the muscles of the stomach and even slow the beat of the heart. Therefore, it is wise to make fewer demands upon your eyes if you are overtired or ill and especially if your eyes are diseased.

Effect of Tobacco and Alcohol

Excessive use of tobacco, particularly in combination with the abuse of alcohol, often causes partial blindness. Inability to distinguish small colored objects, especially green and red objects, is one of the earliest symptoms of overuse of tobacco.

Conclusion

In conclusion, then, the sight may be saved by healthful, moderate living, early care of diseases of other organs, and by the elimination of focal infections. Prolonged use of the healthy eye after full development is apparently not injurious, provided vision is properly corrected by glasses, muscular troubles are treated, illumination is adequate, and general health is good.

Prevention of Blindness from Ophthalmia Neonatorum*

THIS report was prepared in co-operation with the National Society for the Prevention of Blindness through its consultative relationship with the Committee on Conservation of Vision of the State and Provincial Health Authorities of North America. It has brought up to date material previously published in D-63, "Prevention of Blindness in Newborn Babies," published in 1930

Sources of Information

Since this subject is of mutual interest to both organizations, your Committee on Conservation of Vision has once again availed itself of the facilities of the National Society for the Prevention of Blindness in assembling information for the preparation of this report.† Most of these data have been secured during the past four months from the executive health officer of each state and territory of the United States and each province of Canada, who were asked to supply the following:

Item	*Number Supplying Data*		
	States	*Territories*	*Provinces*
Schedule of information on official program for prevention of ophthalmia neonatorum	38 and D.C.	5	9
Excerpts from or copies of pertinent laws and regulations	39 and D.C.	2	7
Sample copy of birth certificate	47 and D.C.	5	9
Sample copy of individual case record form used in investigations by health authorities	13	2	0
Individual records for cases reported in 1937	15	2	4

* Reported by A. C. Jost, M.D., Chairman of the Standing Committee on Conservation of Vision of the State and Provincial Health Authorities of North America, at its 54th Annual Conference, Washington, D. C., April 20–26, 1939.

† For previous reports see Proceedings for 1926 and 1930.

Wherever it has been possible to do so, missing items have been supplied from the files of the National Society for the Prevention of Blindness. Moreover, the present program has been evaluated in the light of historical information already available in the offices of the Society.

History of Official Control Measures in the United States

About 1890, or ten years after Credé's now famous discovery of the efficacy of silver nitrate when used as a prophylactic to prevent ophthalmia neonatorum, New York State passed the first law relating to prevention of blindness from this cause. The law did not mention the use of a prophylactic, but required only that midwives, nurses and others *report* suspected cases to the health officer or to a legally qualified physician. Similar legislation or regulation followed in several other states (Maine, Rhode Island, Minnesota, Ohio, Maryland, New Jersey, Michigan, Missouri, Connecticut, Illinois, Pennsylvania, South Carolina, Iowa, Massachusetts, Idaho). The wording of the laws and regulations was not identical for all states. Most states required reporting of cases to either a health officer or a physician. Two states (Maine and Maryland) required reporting to physicians only. It is significant that the early legislation did not require reporting by physicians. Massachusetts was the first to require that physicians report their cases (1907). At the present time, it is the rule rather than the exception to require reporting by physicians, although the Maine law provides for reporting by non-medical attendants only and the report is made to a physician rather than a local health officer.

It was not until after the appointment of a special committee by the American Medical Association in 1906 and the organization in 1908 of the New York State Committee for the Prevention of Blindness* that public opinion was aroused to the support of mandatory legislation requiring the use of a prophylactic in the eyes of the newborn. Apparently the first state to do this was Wisconsin. A section covering this point, and also authorizing the health officer to provide proper medical care for cases if necessary, was incorporated into Wisconsin law in 1909.

* This State Committee later became the National Society for the Prevention of Blindness.

Once again the example was followed by state after state, so that by 1939 all but three states are requiring the use of a prophylactic for the prevention of ophthalmia neonatorum, although one-third of the states allow exceptions in certain groups of cases.

By 1914 a more inclusive type of legislation began to be introduced. Besides prescribing for reporting of cases and the use of a prophylactic, the law assigns specific duties to the local health officer and to the state health department. For example, the local health officer is usually required to investigate each case reported, he is sometimes given specific authorization to provide necessary medical care for cases and he is required to report to the state health department. The state health department in turn is required to provide for gratuitous distribution of a suitable prophylactic, to keep and publish records of cases of ophthalmia neonatorum and in general, by means of education, regulation, and legal process, to ensure the enforcement of the law.

The more recent laws have tended to include all of the desirable features, although several states do not specifically require investigation of all cases by health officers, several states make no provision for distribution of a prophylactic, and in comparatively few states are health officers empowered to provide medical care of cases other than that usually available for indigents.

More important than the specifications of the laws and regulations is the adequacy of their enforcement. Available information on the effectiveness of existing control measures in reducing the incidence of blindness from ophthalmia neonatorum is inadequate. Nevertheless, such information as exists has been incorporated into the summary of present control procedures.

Definition of Ophthalmia Neonatorum

Any analysis of reports and procedures in various health areas must take into consideration the variations in interpretation of what constitutes an ophthalmia neonatorum case. There are four types of definition in actual use. Not all of these variations are indicated in the wording of laws and regulations. In fact, there is no consistent relation between the terminology used and its interpretation in practice. Nevertheless, reports from health officers show that:

The term "ophthalmia neonatorum" is interpreted to include any indication of inflammation of the eyes of the newborn from whatever cause in:

10 states: Arkansas, Idaho, Illinois, Massachusetts, Minnesota, Mississippi, New York (exclusive of New York City), Oklahoma, Texas, Wisconsin.

3 provinces: Alberta, Prince Edward Island, Quebec.

The term "ophthalmia neonatorum" is interpreted to include eye infections of any type and chemical irritations in:

3 states: Connecticut, Ohio, Rhode Island (also New York City).

1 province: Saskatchewan.

The term "ophthalmia neonatorum" is interpreted to include only infections of the eyes in:

5 states: Alabama, Michigan, New Jersey, Vermont, Virginia.

The term "ophthalmia neonatorum" is interpreted to include only gonorrheal infection of the eyes in:

11 states: Arizona, Colorado, Delaware, Georgia, Kansas, Maine, Missouri, Montana, New Mexico, Tennessee, Washington.

2 territories: Canal Zone, Hawaii.

4 provinces: British Columbia, Manitoba, New Brunswick, Nova Scotia.

(19 states and District of Columbia, 4 territories, 1 province did not report on definition.)

The question naturally arises whether or not it might be desirable to work toward a single standardized definition. In considering the alternative definitions attention may focus on the elimination of all but the gonorrheal infections. This appears to be the present tendency, but it would not be desirable unless it can be proved that the gonorrheal cases are necessarily the only ones resulting in permanent defects of vision of any degree. Your committee had hoped to secure conclusive information on this point by analyzing case records. Unfortunately only 21 health areas were able to supply case records and, of these, 2 states sent only gonorrheal cases and 8 of the remaining health areas are interpreting the term ophthalmia neonatorum as including only gonorrheal cases. In spite of this fact the records received included a non-gonorrheal case which resulted in corneal scars. Moreover, it is not unlikely that children

enrolled in schools for blind with diagnosis of blindness due to ophthalmia neonatorum, but whose cases were never reported to health officers, may have lost their chances of adequate medical care because of discrimination against the non-gonorrheal case. It would seem unwise, at least for the present, to ignore any case which might be due to infection regardless of the organism.

In considering the possibility of infection occurring in the eyes of the newborn it is well to remember that, if silver nitrate is used under ideal conditions, only an occasional gonorrheal case may occur. However, infections of other types may be relatively frequent. Thygeson* found 6.6 per cent of hospital births had some inflammation of the eyes, the most important of which were staphylococcus aureus (hemolytic) 3.4. per cent, pneumococcus 0.9 per cent, inclusion blennorrhea virus 0.6 per cent, pneumococcus and staphylococcus 0.4 per cent, haemophilus influenzae 0.2 per cent.

All of the cases of non-gonorrheal infection recovered without defect after treatment suitable to the type of infection. Hence there is no evidence to indicate whether disastrous results might have occurred if treatment had not been given. The fact remains that almost all were of a type requiring treatment and at least one type (inclusion blennorrhea) involved care over an extended period.

Required Reporting of Ophthalmia Neonatorum Cases

As already mentioned, reporting of cases of ophthalmia neonatorum was the first definite control measure undertaken by health authorities. Latest information shows that:

Reporting of all cases to the health officer is required by *law* in:

25 states: Alabama, California, Connecticut, Delaware, Georgia, Idaho, Illinois, Kentucky, Louisiana, Massachusetts, Mississippi, Nevada, New Hampshire, New Mexico, New York, North Carolina, Ohio, Oklahoma, Oregon, Pennsylvania, Rhode Island, South Dakota, Utah, Virginia, West Virginia.

District of Columbia:

1 territory: Philippine Islands.

2 provinces: Nova Scotia, Quebec.

Physicians are not required to report in:

5 states: Indiana, Iowa, Kansas, Maryland, New Jersey.

* Thygeson, Phillips, M.D.: "Ophthalmia Neonatorum—A Study of 261 Cases," *Transactions* of the American Ophthalmological Society, Vol. XXXIV, 1936, p. 340.

Neither physicians nor midwives are required to report in:
1 state: Wisconsin.

Reports are not required from hospitals or physicians in:
1 state: North Dakota.

Reporting of gonorrheal cases only is required in:
1 state: Colorado.

Reports are required from non-medical attendants only and are made to a physician rather than a health officer in:
1 state: Maine.

Reporting of all cases to the health officer is required by *health department regulation in:*

12 states: Arizona, Florida, Minnesota, Michigan, Missouri, Montana, Nebraska, South Carolina, Tennessee, Vermont, Washington, Wyoming.

1 territory: Puerto Rico.
6 provinces: Alberta, British Columbia, Manitoba, Ontario, Prince Edward Island, Saskatchewan.

Physicians are not required to report in:
2 states: Arkansas, Texas.

Only cases of gonorrhea are reportable in:
1 territory: Hawaii.
1 province: New Brunswick.

Reports are required of midwives only in:
1 territory: Canal Zone.

(Reporting is not required in Alaska and no information on this point is available for the Virgin Islands.)

Reporting laws and regulations are in force in most states, territories and provinces. They appear to be adequate for bringing to the attention of health authorities all infants who may be in need of skilled treatment to save vision in all but the 11 states, 2 territories and 1 province, which allow certain exceptions. However, existing legislation cannot be evaluated apart from its interpretations in practice and its enforcement. Your attention has been called to the tendency to restrict the scope of requirements by narrow interpretation. Tabulations of cases reported obviously

reflect this tendency and are affected also by incompleteness of reporting.

Number of Ophthalmia Neonatorum Cases Reported

Figures showing the number of cases reported by health area are shown for the nine-year period for which they are available. Case rates per 1,000 live births have been computed for the year 1937. The extreme variations do not give an accurate index of variations in incidence of ophthalmia neonatorum. They undoubtedly reflect differences in requirements and in the way these requirements are interpreted and enforced.

It should be noted that the figures for Massachusetts include eye infections among older age groups, and therefore its rate is not comparable to that in other states.

Some of the other high rates, as in Ohio, Connecticut, Maryland and New Jersey, may represent completeness in reporting rather than high incidence of ophthalmia neonatorum. On the other hand, in some instances health officers have stated that the very low rates cannot be assumed to picture actual conditions in their health areas. Moreover, during the period of compilation of the present report at least a few state health officers had the experience of turning up cases (some of them cases of blindness) which had never been included in the departments' official counts.

On the whole reporting appears to be quite incomplete. Whether further effort should be made to increase reporting in any health area would depend upon the actual conditions in that area. An occasional intensive check-up with hospitals, physicians, and midwives, as well as with commissions and schools for the blind, would seem advisable to improve reporting.

Investigation of Cases by Health Officer

Investigation of every case reported is routine in:

18 states: Alabama, Arkansas, Connecticut, Delaware, Florida, Illinois, Indiana, Maryland, Massachusetts, Minnesota, New Mexico, New York, Ohio, Oklahoma, Rhode Island, Tennessee, Utah, Virginia.

3 territories: Canal Zone, Puerto Rico, Virgin Islands.

5 provinces: Alberta, Manitoba, New Brunswick, Prince Edward Island, Quebec.

Cases are investigated only if the attending physician requests it in:

1 state: Maine.

Only cases attended by midwives are investigated in:

1 state: Georgia.

Cases are not investigated if the parents object in:

1 state: Illinois.

In the remaining health areas some follow-up may be done, but it is not reported that routine investigations are made of all cases, although in at least seven states (Colorado, Idaho, Louisiana, Mississippi, North Carolina, South Dakota, West Virginia) health officers have been authorized by law or regulation to do so.

All but Florida, Minnesota and Virginia report that investigations are made "immediately" after receipt of report.

Unless health officers are convinced that adequate medical care is already accessible and will be sought by parents and attendants for every infant needing care, it seems unwise to omit follow-up of cases. Potentially any case reported may have serious consequences. Without investigation it is impossible to determine which cases warrant special attention and how this is to be arranged.

Laboratory Reports

Laboratory reports indicating the organism responsible for the ophthalmia are secured in every case in:

12 states: Arkansas, Connecticut, Delaware, Maine, Massachusetts, Michigan, Montana, New Jersey, New Mexico, New York, Rhode Island, South Dakota.

District of Columbia:

4 territories: Canal Zone, Hawaii, Puerto Rico, Virgin Islands.

3 provinces: Alberta, Manitoba, New Brunswick.

The use of the laboratory to determine the presence or absence not only of the dread gonococci, but of any other infecting organism as well, is a guide to proper treatment which is too frequently neglected even when available.

Investigator's Records

Special case records are used to report cases investigated in:

7 states: Connecticut, Massachusetts, Michigan, New York (exclusive of New York City), Ohio, Rhode Island, Utah.
1 territory: Puerto Rico.

Either the venereal disease record form or the regular epidemiological reports are used by investigators in:

6 states: Delaware, Indiana, Kansas, Louisiana, Maine, Tennessee.
1 territory: Hawaii.

Although invaluable to the administrator in planning a control program, the use of a case record form appears to be the exception rather than the rule. Among the notable exceptions is the follow-up and record system of the New York State Department of Health. The plan was evolved with the cooperation of the Bureau of Services for the Blind of the New York State Department of Social Welfare, and unfortunately it is not in use in New York City.

The investigator's report includes a statement showing the ultimate outcome of each case, in terms of degree of permanent eye defect in:

8 states: Maryland, Massachusetts, Michigan, Mississippi, New York, Ohio, Rhode Island, Vermont.
1 territory: Hawaii.

Reports on the final outcome of each case after completion of treatment have not usually been required. However, the health officer should record this information as a check on the adequacy of service rendered. Moreover, he can and should take responsibility for seeing that the infant with an eye defect is referred for further corrective treatment, when this is possible, or for training as a handicapped child.

Facts Available From Case Records

The original plans for the present survey included a study of all cases reported in 1937. However, it soon became apparent that the information requested was not generally available.

Case records were received from:
15 states: Alabama, Arkansas, Connecticut, Delaware, Illinois,

Kansas, Maine, Maryland, Massachusetts, Michigan, New York, Ohio, Oregon, Rhode Island, Utah.

2 territories: Hawaii, Puerto Rico.

4 provinces: British Columbia, Manitoba, Nova Scotia, Saskatchewan.

Unfortunately the group of records received proved insufficient for conclusive analysis. The total group numbered only 276, or less than 10 per cent of the cases reported. Moreover, in several instances only selected cases, such as the gonorrheal cases, were forwarded. Because of the limitations of the group studied the following statements are offered not as facts but as items of interest:

1. In practically all cases the inflammation was noted before the fourteenth day after birth. Whether this offers proof of the adequacy of the usual time limit or merely indicates a tendency to ignore cases occurring after two weeks, it would be difficult to tell.

2. The proportion of cases reported to the health officer within 24 hours after symptoms are noted is disappointingly small. This is somewhat offset by the fact that nearly half of the cases are brought under medical care within that time. Nevertheless there appears to be need for reemphasis on the importance of speed both in reporting and in securing medical treatment.

3. The length of the period of medical care was reported as unknown in half the cases, and as four weeks or more in one-quarter of the cases. The cases having an unsatisfactory outcome apparently require a longer period of care on the average, but these were by no means the only cases. (In this connection it will be of interest to health officers to watch the results of experiments with the newer drugs which apparently promise to shorten the period of treatment.)

4. Among the cases studied 19, or approximately 7 per cent, resulted in some loss of vision, usually in both eyes. (Information is too indefinite in many cases to allow classification as blind or partially-seeing.)

5. Because of limitations of the data, it is not possible to state with any degree of assurance the factors which were responsible for loss of vision. However, there is evidence that the following influenced results:

a. Gonorrheal infections occurring despite use of a prophylactic.
b. Non-gonorrheal infections, despite use of a prophylactic.
c. Non-use of a prophylactic, or use of an inadequate drug.
d. Delay in securing medical treatment.
e. Prematurity or malnutrition of the infant.
f. Inadequate prenatal care, particularly failure to diagnose infection in the mother.

Distribution and Use of a Prophylactic

Because of the general reliance on the universal use of a prophylactic at birth as the most essential procedure in the control of ophthalmia neonatorum, it is of special interest to check on the amount of free prophylactic distributed and the extent to which birth certificates are used as a means of checking whether a prophylactic has been used.

The 1937 distribution of prophylactic was sufficient for all live births in:

7 states: Alabama, Illinois, Massachusetts, Michigan, New Mexico, Oklahoma, Rhode Island.
1 territory: Virgin Islands.
1 province: Ontario.

The distribution was at least sufficient for non-hospital births in several additional states, as indicated:

8 states: Connecticut, Minnesota, Mississippi, New York, North Carolina, Ohio, Virginia, Wisconsin.

The distribution was at least sufficient for births attended by midwives in several additional states, as indicated:

10 states: Colorado, Delaware, Florida, Missouri, Montana, New Hampshire, New Jersey, South Dakota, Tennessee, West Virginia.

(Since full data on the distribution of births were not available for all territories and provinces, no estimates of the adequacy of the supply of prophylactic distributed could be made.)

In view of the comparatively low cost of the ampules of silver nitrate it would be advisable to make them available at least for all non-hospital births to insure the use of this preventive. In health areas which are not already doing so, it might be advisable

to give consideration to the development of a plan for distributing to all recognized birth attendants a supply of silver nitrate sufficient for the number of births attended by each.

The birth certificates show that the attendant at birth is asked to state whether prophylaxis was used to prevent ophthalmia neonatorum in:

29 states: Arkansas, California, Delaware, Georgia, Idaho, Illinois, Indiana, Iowa, Kansas, Louisiana, Michigan, Minnesota, Missouri, Montana, Nebraska, New Jersey, New Mexico, New York (exclusive of New York City), Ohio, Oklahoma, Oregon, North Dakota, Rhode Island, Texas, Utah, Virginia, West Virginia, Wisconsin, Wyoming.

2 territories: Hawaii, Puerto Rico.

3 provinces: British Columbia, Nova Scotia, Prince Edward Island.

The state of South Carolina has recently passed a law requiring that information concerning the use of a prophylactic be added to the birth certificate.

Information on this point is not available for the Phillipine Islands. The health areas which do not include this item on the birth certificate are: 18 states (Alabama, Arizona, Colorado, Connecticut, Florida, Kentucky, Maine, Maryland, Massachusetts, Mississippi, Nevada, New Hampshire, North Carolina, Pennsylvania, South Dakota, Tennessee, Vermont, Washington), the District of Columbia, 3 territories (Alaska, Canal Zone, Virgin Islands), and 6 provinces (Alberta, Manitoba, New Brunswick, Ontario, Quebec, Saskatchewan).

The mere presence on the birth certificate of a question relating to prophylaxis undoubtedly has an educational value. However, it is highly desirable that the responses be checked at least periodically and that violations of the law be investigated.

Progress to Date

For over thirty years it has been the practice of the National Society for the Prevention of Blindness to collect annual data on the number of new pupils entering schools for the blind in the United States because of blindness due to ophthalmia neonatorum. Although this figure is not actually a check on current cases of blindness from ophthalmia neonatorum—because children enter

school six or seven years after the occurrence of blindness from ophthalmia neonatorum—in the absence of a better index we have used this figure year by year to check the success of the ophthalmia neonatorum control program.

The latest figure available shows that in 1937–38, 7.4 per cent of the new pupils entering schools for the blind were blind because of ophthalmia neonatorum. Compared with the rate for the school year 1906–07, which was 28.2 per cent, there has been a 74 per cent reduction. However, a glance at the rates for the past eight years shows that there has been little change. Thus there is some indication that the existing control measures, or more specifically the present practices in carrying out the control program, cannot be expected to produce much more reduction in the incidence of blindness from ophthalmia neonatorum. Apparently the figures on cases of ophthalmia neonatorum reported to the health department show about the same tendency. If this is true we must either accept the fact that some blindness from this cause is inevitable or we must do more than we are now doing to insure better results.

Summary

Historically the public health program for the prevention of blindness from ophthalmia neonatorum has shown several stages of development during the past fifty years. These are:

1. An effort to have all cases brought to the attention of a physician for treatment after the infection had occurred—*i. e.*, case reporting.
2. An insistence upon use of a prophylactic in the eyes of the newborn by the attendant at birth.
3. An acceptance by the local health officer of responsibility for follow-up of cases to insure proper treatment.
4. An authorization to the state health department to supply free prophylactics.
5. An authorization to supply free expert medical and nursing care on an emergency basis.

There has been a gradual increase in the number of health areas making the above provisions. However, at the present time they are by no means universal. Some areas lack legal authorization

for certain portions of the program, while many others show a tendency to become lax in enforcement.

The remarkable reduction in blindness from ophthalmia neonatorum is cause for rejoicing but it seems probable that we may not attain 100 per cent elimination of blindness from this cause without further intensive effort.

Recommendations

It is recommended that:

1. An effort be made to standardize definitions and routine control measures.
2. Areas now lacking in legal authorization for any essential parts of the control program be brought up to standard in these respects.
3. An effort be made to secure additional personnel and funds for the program wherever needed.
4. The health officer in each state, territory and province check the completeness of case reporting in his area and, where this is proved necessary, devise plans for better enforcement of the existing legislation on this point.
5. The amount of prophylactic distributed be increased to meet the needs more adequately.
6. Local health officers be advised to make complete and prompt investigation of all cases reported to insure adequate bacterial diagnosis and appropriate treatment.
7. Special provision be made for expert ophthalmological and nursing care whenever necessary. These services to be arranged without delay and available also for similar emergency cases occurring at a later age.
8. The end results of all cases be investigated and incorporated in case summaries forwarded to the executive officer of each health area.
9. The above mentioned case records and other sources of information be analyzed by your committee to determine whether further developments in the program are needed and if so, what.
10. Laboratory research organizations be encouraged to experiment in the development of safe and efficient drugs for prophylaxis and/or treatment of ophthalmia neonatorum.

Appendix

Summary of Laws and Regulations* Requiring Reporting of Ophthalmia Neonatorum Cases as of 1939

Health Area	*Reporting of Cases Required by*	*Year Initiated†*	*Limitations in Law or Regulation, if Any*
State			
Alabama	Law	1915	
Arizona	H.D. Reg.	1914	
Arkansas	H.D. Reg.	1913	Reporting by physicians not required
California‡	Law	1915	
Colorado	Law and H.D. Reg.	1916	Law makes cases not attended by physician reportable to physician only Regulations make reportable gonorrheal cases only
Connecticut	Law	1895	
Delaware‡	Law	1917	
Dist. of Columbia	Law	1911	
Florida‡	H.D. Reg.	1917	
Georgia	Law	1918	
Idaho	Law	1907	
Illinois	Law	1895	
Indiana	Law	1911	Reporting by physicians not required
Iowa‡	Law	1896	Reporting by physicians not required
Kansas	Law	1913	Reporting by physicians not required
Kentucky‡	Law	1914	
Louisiana‡	Law	1914	
Maine	Law	1891	Reporting by physicians not required Cases not attended by physicians, made reportable to physicians only
Maryland‡	Law	1894	Reporting by physicians not required
Massachusetts	Law	1902	
Michigan	Law and H.D. Reg.	1895	Law makes cases not attended by physician reportable to physician only Regulation makes ophthalmia neonatorum reportable as any communicable disease

H.D. Reg.—Health Department Regulation.

* Regulations of state health departments usually have the status of laws.

† Year given is first year in which some law or regulation was put into effect. The status of the legislation and the actual requirements may have undergone changes between the year stated and the present date.

‡ Information as of 1930.

Summary of Laws and Regulations*—*Continued*

Health Area	*Reporting of Cases Required By*	*Year Initiated†*	*Limitations in Law or Regulation, if Any*
State			
Minnesota	H.D. Reg.	1893	
Mississippi	Law	1916	
Missouri	H.D. Reg.	1895	
Montana	H.D. Reg.	1913	
Nebraska‡	H.D. Reg.	1915	
Nevada‡	Law	1921	
New Hampshire	Law	1911	
New Jersey	Law	1895	Reporting by physicians not required
New Mexico‡	Law	1919	
New York	Law	1890	
North Carolina‡	Law	1915	
North Dakota‡	Law	1911	Reporting by hospital and physicians not required
Ohio	Law	1894	
Oklahoma	Law	1921	
Oregon	Law	1915	
Pennsylvania‡	Law	1895	
Rhode Island	Law	1892	
South Carolina‡	H.D. Reg.	1896	
South Dakota	Law	1913	
Tennessee	H.D. Reg.	1911	
Texas	H.D. Reg.	1911	Reporting by physicians not required
Utah	Law	1911	
Vermont‡	H.D. Reg.	1910	
Virginia	Law	1918	
Washington‡	H.D. Reg.	1912	
West Virginia	Law	1916	
Wisconsin	Law	1909	Reporting by physician or midwife not required
Wyoming‡	H.D. Reg.	?	
Provinces			
Alberta‡	H.D. Reg.	?	
British Columbia‡	H.D. Reg.	?	
Manitoba‡	H.D. Reg.	?	
New Brunswick	H.D. Reg.	?	Gonorrheal cases reportable under venereal disease regulation
Nova Scotia	Law	?	
Ontario	H.D. Reg.	?	
P. E. I.	H.D. Reg.	?	
Quebec	Law	?	
Saskatchewan	H.D. Reg.	?	

H.D. Reg.—Health Department Regulation.

* Regulations of state health departments usually have the status of laws.

† Year given is first year in which some law or regulation was put into effect. The status of the legislation and the actual requirements may have undergone changes between the year stated and the present date.

‡ Information as of 1930.

Summary of Laws and Regulations*—Continued

Health Area	Reporting of Cases: Required By	Reporting of Cases: Year Initiated†	Limitations in Law or Regulation, If Any
Territories			
Alaska	Not Required	..	
Canal Zone	H.D. Reg.	?	Midwives only
Hawaii	H.D. Reg.	?	Gonorrheal cases only
P. I.‡	Law	1929	
P. R.‡	H.D. Reg.	1899	
Virgin Islands	N.R.	N.R.	

H.D. Reg.—Health Department Regulation.

* Regulations of state health departments usually have the status of laws.

† Year given is first year in which some law or regulation was put into effect. The status of the legislation and the actual requirements may have undergone changes between the year stated and the present date.

‡ Information as of 1930.

Number of Ophthalmia Neonatorum Cases Reported

Health Area	1929	1930	1931	1932	1933	1934	1935	1936	1937	No. Cases Per 1,000 Live Births
Alabama	26	22	14	19	14	15	20	19	14	.23
Arizona	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	15	1.43
Arkansas	21	14	8	5	9	10	16	3	16	.45
California	23	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	31	.33
Colorado	2	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.
Connecticut	2	31	93	81	10	98	138	189	87	3.83
Delaware	1	1	2	4	1	0	2	1	7	1.61
Dist. of Col.	0	N.R.	N.R.	N.R.	N.R.	N.R.	5	4	9	.73
Florida	4	0	0	2	0	0	0	3	5	.17
Georgia	20	N.R.	N.R.	N.R.	1	2	0	3	4	.06
Idaho	1	0	0	0	0	0	1	0	1	.10
Illinois	561	323	95	77	82	53	66	53	44	.38
Indiana	N.R.	2	2	1	1	1	1	0	1	.02
Iowa	4	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.
Kansas	2	2	2	1	0	3	0	2	1	.03
Kentucky	12	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.
Louisiana	5	6	2	4	0	1	5	6	7	.15
Maine	2	2	3	10	5	1	2	1	2	.13
Maryland	19	90	87	89	90	77	63	66	65	2.33
Mass.[a]	1,399	1,289	1,249	1,138	1,018	1,072	1,076	1,116	1,069	17.40
Michigan	28	0	0	0	0	9	12	14	21	.23
Minnesota	0	6	6	6	7	7	8	1	6	.12
Mississippi	172	168	106	75	99	122	113	96	66	1.27
Missouri	24	42	20	11	6	10	6	12	5	.09
Montana	0	4	2	0	0	2	0	0	2	.19
Nebraska	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.
Nevada	0	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.
New Hamp.	4	0	2	2	1	0	1	2	0	0
New Jersey	42	43	36	28	26	20	23	112	128	2.35
New Mexico	7	47	26	48	35	14	24	14	44	3.19

[a] Includes all types of infection and all ages.

Number of Ophthalmia Neonatorum Cases Reported—*Continued*

Health Area	*1929*	*1930*	*1931*	*1932*	*1933*	*1934*	*1935*	*1936*	*1937*	*No. Cases Per 1,000 Live Births*
N. Y. City	N.R.	3	1	0	1	1	5	15	26	.25
N. Y. State	63	60	47	58	42	67	69	99	97	1.16
No. Carolina	12	14	12	18	9	14	19	22	17	.21
No. Dakota	0	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.
Ohio	1,156	1,268	947	989	1,069	886	999	878	773	7.20
Oklahoma	16	8	12	6	9	6	7	12	12	.30
Oregon	2	0	1	2	1	2	2	0	1	.06
Pennsylvania	151	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.
Rhode Island	N.R.	7	10	3	3	5	1	3	7	.68
So. Carolina	164	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.
So. Dakota	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	1	0	N.R.
Tennessee	38	28	35	30	37	36	25	38	40	.77
Texas	16	10	4	5	22	55	27	27	72	.62
Utah	0	0	0	0	0	0	1	0	2	.16
Vermont	0	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.
Virginia	N.R.	11	16	24	11	9	14	12	22	.42
Washington	2	0	1	2	1	4	2	0	0	0
West Va	6	10	7	11	5	8	0	3	9	.21
Wisconsin	23	12	13	12	6	19	10	11	7	.13
Wyoming	2	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.
Sub-total	4,032	3,523	2,861	2,761	2,621	2,629	2,763	2,838	2,735	1.50
Provinces of Canada										
Alberta	N.R.	0	0	0	0	0	0	0	0	0
B. C.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	1	1	2	.18
Manitoba	0	2	0	1	1	0	0	0	3	.23
N. B.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.
N. S.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	4	.35
P. E. I.	N.R.	2	1	1	2	0	0	0	0	0
Ontario	15	1	5	52	2	3	1	1	6	.10
Quebec	0	N.R.	N.R.	28	15	16	13	14	35	1.88
Sask.	7	0	0	1	1	1	1	0	1	.05
Sub-total	22	5	6	83	21	20	16	16	51	
Territories										
Alaska	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.
Canal Zone	N.R.	7	14	4	9	3	5	10	15	?
Hawaii	4	0	0	0	0	0	0	1	4	.47
P. I.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.
P. R.	1	N.R.	93	85	74	68	73	47	22	?
Virg. Is.	N.R.	2	1	0	0	4	0	2	0	0
Sub-total	5	9	108	89	83	75	78	60	41	
Grand total	4,059	3,537	2,975	2,933	2,725	2,724	2,857	2,914	2,827	1.40(?)

Summary of State Laws and Regulations* Requiring the Use of a Prophylactic for the Prevention of Ophthalmia Neonatorum as of 1939

Health Area	*Use of a Prophylactic Required By*	*Year† Initiated*	*Limitations in Law or Regulations, if Any*
State			
Alabama	Law	1919	
Arizona	..	..	
Arkansas	H.D. Reg.	1922	
California‡	H.D. Reg.	1925	Limited to births in hospitals and maternity homes
Colorado	Law	1937	Waived if parents object
Connecticut	Law	1935[a]	
Delaware	Law	1917	
Dist. of Col.	Law	1937	
Florida	H.D. Reg.	1918–22	Limited to births attended by midwives
Georgia	Law	1918	
Idaho	Law	1916[b]	
Illinois	Law	1933	
Indiana	Law	1911	Limited to cases in which possibility of infection is suspected
Iowa	Law	1921	Waived if parents object
Kansas	Law	1929	Waived if parents object
Kentucky‡	H.D. Reg.	1914	
Louisiana‡	H.D. Reg.	1914	
Maine	Law	1919	Waived if parents object
Maryland‡	Law	1924	Limited to births attended by midwives
Massachusetts	Law	1936	
Michigan	Law	1913	
Minnesota	H.D. Reg.	1916	Waived if parents object
Mississippi	Law	1916	Limited to births in hospitals and maternity homes and those attended by midwives
Missouri	Law	1921	
Montana	..	..	
Nebraska	Law	1915	
Nevada	Law	1921	
New Hampshire	Law	1919	
New Jersey‡	H.D. Reg.?	?	
New Mexico‡	H.D. Reg.	1922	Waived if parents object
New York	Law	1922	
North Carolina	Law	1917	

H. D. Reg.—Health Department Regulation.

* Regulations of state health departments usually have the status of laws.

† Year given is first year in which some law or regulation was put into effect. The status of the legislation and the actual requirements may have undergone changes between the year stated and the present date.

‡ Information as of 1930.

[a] Connecticut law in force 1921 to 1935 was limited to births in state-aided institutions and those attended by midwives.

[b] Idaho regulation in force 1913 to 1916.

Summary of State Laws and Regulations*—Continued

Health Area	*Use of a Prophylactic Required By*	*Year† Initiated*	*Limitations in Law or Regulations, if Any*
State			
North Dakota‡	Law	1911	Limited to cases in which possibility of infection is suspected
Ohio	Law	1913–15	Limited to births in hospitals and maternity homes and those attended by midwives
Oklahoma	Law	1921	Waived if parents or physicians object
Oregon	H.D. Reg.	1919	
Pennsylvania‡	H.D. Reg.	1926	
Rhode Island	Law	1914	
South Carolina[c]	Law	1939	
South Dakota	Law	1925	
Tennessee‡	Law	1915	
Texas	Law	1921	
Utah[d]	..	..	
Vermont	H.D. Reg.	1939	
Virginia	Law	1918	
Washington	H.D. Reg.	1921	
West Virginia	Law	1919	
Wisconsin	Law	1909	
Wyoming‡	Law	1921	Waived if parents object
Provinces			
Alberta	H.D. Reg.	?	
British Columbia‡	H.D. Reg.	?	
Manitoba	..	..	
New Brunswick	H.D. Reg.	?	
Nova Scotia	H.D. Reg.	?	
Ontario	H.D. Reg.	?	Limited to births attended by physicians
P. E. I.	H.D. Reg.	?	
Quebec	..	..	
Saskatchewan	H.D. Reg.	?	Limited to births attended by physicians
Territories			
Alaska‡	H.D. Reg.	?	
Canal Zone	H.D. Reg.	?	Limited to births attended by midwives
Hawaii	H.D. Reg.	?	
Philippine Islands	..	..	
Puerto Rico	H.D. Reg.	?	
Virgin Islands	N.R.	..	

H.D. Reg.—Health Department Regulation.

* Regulations of state health departments usually have the status of laws.

† Year given is first year in which some law or regulation was put into effect. The status of the legislation and the actual requirements may have undergone changes between the year stated and the present date.

‡ Information as of 1930.

[c] South Carolina regulation in force for midwives only since 1919.

[d] Use of a prophylactic is recommended in health department regulation of Utah.

Distribution of Prophylactic

Health Area	*Type and Strength*	*Free*	*Hosp.*	*Phys.*	*Mid-wife*	*Container*	*Amount Distributed Sufficient for*	
							No. of Births	*% of Total Births*
State								
Alabama	$AgNO_3$ 1%	Yes	Yes	Yes	Yes	Beeswax cap.	64,204 [i]	100+
Arizona	None	..	..	..	..	..	..	0
Arkansas	$AgNO_3$ 1%	Yes	Yes	Yes	Yes	Wax amp.	2,450 [c]	14
California	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.
Colorado	$AgNO_3$ 1%	Yes	Yes	Yes	Yes	Wax amp.	7,000 [j]	36
Conn.	$AgNO_3$ 1%	Yes	Yes	Yes	Yes	Paraffin	20,325 [i]	89
Delaware	$AgNO_3$ 1%	Yes	Yes	Yes	Yes	Wax amp.	1,500 [j]	34
D. C.	$AgNO_3$ 1%	Yes	Yes	Yes	Yes	Wax amp.	[g]	..
Florida	$AgNO_3$ 1%	Yes	Yes	Yes	Yes	Wax amp.	17,433 [j]	59
Georgia	$AgNO_3$ 1%	Yes	Yes	Yes	Yes	Wax amp.	39,203 [b]	31
Idaho	None	..	..	..	..	..	..	0
Illinois	$AgNO_3$ 1%	Yes	Yes	Yes	Yes	Wax amp.	141,424 [i]	100+
Indiana	None	No	..	..	No	None	None	0
Iowa	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.
Kansas	$AgNO_3$ 1%	Yes	Yes	Yes	Yes	Wax amp.	N.R.	N.R.
Kentucky	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.
Louisiana	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.
Maine	$AgNO_3$ 1%	Yes	Yes	Yes	Yes	Wax amp.	1,008	7
Maryland	$AgNO_3$ 1%	Yes	Yes	Yes	Yes	Wax amp.	N.R.	N.R.
Mass.	$AgNO_3$ 1%	Yes	Yes	Yes	[a]	Wax amp.	76,340 [i]	100+
Michigan	$AgNO_3$ 1.5%	Yes	Yes	Yes	Yes	Wax amp.	117,012 [d,i]	100+
Minnesota	$AgNO_3$ 1%	Yes	Yes	Yes	Yes	Wax amp.	37,020 [i]	77
Mississippi	$AgNO_3$ 1%	Yes	Yes	Yes	Yes	Beeswax	44,425 [i]	85
Missouri	$AgNO_3$ 1%	Yes	Yes	Yes	Yes	Wax amp.	4,690 [j]	8
Montana	$AgNO_3$ 1%	Yes	Yes	Yes	Yes	Wax amp.	5,236 [b,j]	26
Nebraska	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.
Nevada	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.
N. H.	$AgNO_3$ 1%	Yes	Yes	Yes	Yes	Wax amp.	1,000 [j]	13
New Jersey	$AgNO_3$ 1%	Yes	No	No	Yes	Wax amp.	3,300 [j]	6
N. M.	$AgNO_3$ 1%	Yes	Yes	Yes	Yes	Wax amp.	24,000 [i]	100+
N. Y. S.	$AgNO_3$ 1%	Yes	Yes	Yes	Yes	Wax amp.	55,259 [i]	66
N. Y. C.	$AgNO_3$ 1%	Yes	Yes	Yes	Yes	Beeswax	3,000	3
N. C.	$AgNO_3$ 1%	Yes	Yes	Yes	Yes	Wax amp.	66,500 [i]	84
N. D.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.
Ohio	$AgNO_3$ 1%	Yes	Yes	Yes	Yes	Wax amp.	123,000 [b,i]	57

[a] Midwives not recognized.

[b] Ampules.

[c] Not distributed free until July 1, 1937.

[d] Year ending June 30, 1938.

[g] Not distributed until 1938.

[i] Quantity distributed sufficient for non-hospital births.

[j] Quantity distributed sufficient for births attended by midwives.

Distribution of Prophylactic—Continued

Health Area	*Type and Strength*	*Free*	*Hosp.*	*Phys.*	*Mid-wife*	*Container*	*Amount Distributed Sufficient for*	
							No. of Births	*% of Total Births*
State								
Oklahoma	$AgNO_3$ 1%	Yes	Yes	Yes	Yes	Capsule	50,000[i]	100+
Oregon	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.
Penna.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.
R. I.	$AgNO_3$ 1%	Yes	Yes	Yes	Yes	Wax amp.	[f,i]	100
S. C.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.
S. D.	$AgNO_3$ 1%	Yes	Yes	Yes	Yes	Wax amp.	3,168[j]	27
Tennessee.	$AgNO_3$ 1%	Yes	Yes	Yes	Yes	Wax amp.	32,508[j]	63
Texas	$AgNO_3$ 1%	Yes	No	No	Yes	Wax-Par. amp.	13,198	11
Utah	None	No	No	No	No	None	N.R.	N.R.
Vermont	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.
Virginia	$AgNO_3$ 1%	Yes	Yes	Yes	Yes	Wax amp.	50,000[i]	97
Wash.	None	No	No	No	No	None	N.R.	0
W. Va.	$AgNO_3$ 1%	Yes	Yes	Yes	Yes	Wax tube	10,820[e,j]	26
Wisconsin.	$AgNO_3$ 1%	Yes	Yes	Yes	Yes	Wax-Par. amp.	100,000[b,i]	93
Wyoming.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.
Provinces of Canada								
Alberta	None	..	..	..	..	..	None	0
Brit. Col.	$AgNO_3$ 1%	Yes	No	Yes	Yes[h]	Wax amp.	1,144	10
Manitoba.	$AgNO_3$ 1%	Yes	Yes	Yes	None	N.R.	2,071	16
N. B.	$AgNO_3$ 1%	Yes	Yes	Yes	Yes	Wax amp.	650	6
N. S.	$AgNO_3$ 1%	Yes	Yes	Yes	Yes	Wax cap.	5,000	43
Ontario	$AgNO_3$ 1%	Yes	Yes	Yes	N.R.	Vial with dropper	71,405	100+
P. E. I.	$AgNO_3$ 1%	Yes	Yes	Yes	Yes	Amp.	2,000	96
Quebec	$AgNO_3$ 1%	Yes	Yes	Yes	[a]	Wax amp.	78,768[b]	52
Sask.	$AgNO_3$ 1%	Yes	Yes	Yes	[a]	Wax cap.	9,000[b]	24
Territories								
Alaska	$AgNO_3$ 1%	Yes	Yes	Yes	Yes	Amp.	1,000	?
Canal Zone	$AgNO_3$ 1% Argyrol 25%	Yes	Yes	Yes	Yes	Bottle	4,529	?
Hawaii	$AgNO_3$ 1%	Yes	No	No	Yes[a]	Wax amp.	N.R.	..
P. I.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.
P. R.	$AgNO_3$ 1%	Yes	No	No	Yes	Wax amp.	24,000	?
Virgin Is.	$AgNO_3$ 1%	Yes	Yes	Yes	Yes	Bottle	All	100

[a] Midwives not recognized.

[b] Ampules.

[e] Fiscal year—1936–37.

[f] Quantity sufficient for all births.

[h] Distributed free to Victorian Order of Nurses and Public Health Nurses.

[i] Quantity distributed sufficient for non-hospital births.

[j] Quantity distributed sufficient for births attended by midwives.

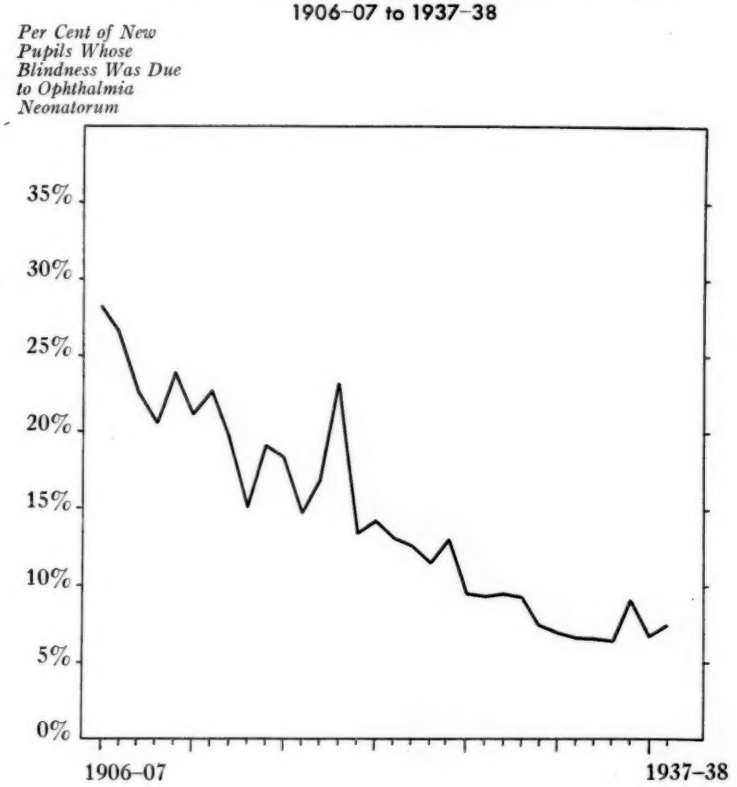
Per Cent of New Admissions to Schools and Classes for the Blind Whose Blindness was Due to Ophthalmia Neonatorum, Shown by School Year Begining 1906–1907

	NEW PUPILS ADMITTED			
		PUPILS WITH BLINDNESS DUE TO OPHTHALMIA NEONATORUM		
School Year	*Total Number*	*Number*	*Per Cent*	*Five-Year Average Per Cent*
1906–07.....	206	58	28.2	
1907–08.....	290	77	26.5	
1908–09.....	300	68	22.6	
1909–10.....	325	67	20.6	22.8
1910–11.....	351	84	23.9	
1911–12.....	415	88	21.2	
1912–13.....	386	88	22.7	
1913–14.....	428	84	19.6	
1914–15.....	602	91	15.1	18.7
1915–16.....	666	127	19.1	
1916–17.....	647	119	18.4	
1917–18.....	614	90	14.7	
1918–19.....	622	105	16.9	
1919–20.....	749	174	23.2	16.6
1920–21.....	702	95	13.5	
1921–22.....	760	108	14.2	
1922–23.....	738	97	13.1	
1923–24.....	714	91	12.7	
1924–25.....	800	92	11.5	12.0
1925–26.....	776	101	13.0	
1926–27.....	694	66	9.5	
1927–28.....	774	72	9.3	
1928–29.....	695	66	9.5	
1929–30.....	740	68	9.2	8.4
1930–31.....	908	68	7.5	
1931–32.....	899	63	7.0	
1932–33.....	810	54	6.7	
1933–34.....	422	28	6.6	
1934–35.....	495	32	6.5	7.0
1935–36.....	441	40	9.1	
1936–37.....	596	40	6.7	
1937–38.....	638	47	7.4	

NOTE: Actual number of cases shown in table should not be used to show trends since the number of schools from which figures are available differs from year to year. Even in the later years figures do not include all schools in the country.

Chart Showing Decrease in Cases of Blindness Due to Ophthalmia Neonatorum, Entering United States Schools for the Blind

1906–07 to 1937–38



The Forum

THIS section is reserved for brief or informal papers, discussions, questions and answers, and occasional pertinent quotations from other publications. We offer to publish letters or excerpts of general interest, assuming no responsibility for the opinions expressed therein. Individual questions are turned over to consultants in the particular field. Every communication must contain the writer's name and address, but these are omitted on request

The Story of a Fireworks Bill

Background of House Bill 305—Woodside—an Act (65) to prohibit the sale and use of fireworks in Pennsylvania.

An ordinance prohibiting the sale and use of fireworks in Philadelphia was passed by City Councils in 1921 and honest effort was made to enforce it; but each year thereafter bootleg fireworks found their way into the city and 4th of July celebrating took a gruesome toll in burns, lacerations and, not infrequently, blinded eyes and death.

The Philadelphia Committee for Prevention of Blindness, which came into being February 15, 1936, began immediately to take stock of wasted eyes and other evidence of crippling, and two months later planned an educational campaign to stimulate civic interest in making the Fireworks Ordinance effective. More 4th of July accidents were reported that year than ever before.

A similar but more ambitious program was set up in 1937. Public and private agencies, churches, radio, and the press united wholeheartedly in an effort to make Philadelphia safe for children. Nearly all hospitals reported fireworks accidents they treated—201 was the crop that year.

All injuries to eyes were followed and all recommendations for treatment were carried through. An effort was made to locate the source of supply of offending explosives but very little substantial information was secured. Even though the toll of accidents that summer was high we noted with satisfaction a growing sentiment against fireworks and we seized the opportunity to begin talking in terms of a state law to control their sale and use.

Early in 1938 we organized an Eye Safety poster contest in the Philadelphia high schools and asked that emphasis be placed on the

hazards of 4th of July celebrating. The winning poster was reproduced and 43 Boy Scout Troops distributed them for display a week or two before the 4th. Eventually the entire Scout membership, 11,000, was organized to watch city blocks and report any evidence of selling or shooting off firecrackers. More than 1,000 churches made announcements from pulpits and published warning articles in their bulletins. The Pennsylvania and Reading Company Railroads distributed posters. The Philadelphia Chamber of Commerce came out publicly in support of our efforts. The police officers were charged with the duty of patrolling every city block and they were further directed to provide transportation for all injured persons to nearby hospitals for treatment. Then they stopped around later for reports as to the extent of the injuries and the physician's prognosis.

Local radio stations started their publicity June 22. More than 100 "spots," talks and electrical transcriptions, which set forth the danger from fireworks, were presented.

All newspapers issued warnings and urged parents to join in the crusade to stop needless waste of life and eyes.

On July 5 wartime headlines announced the frightful news of 402 accidents. Children hovered between life and death, eyes had been blinded, fingers blown off and countless bodies were smarting from cruel burns.

The *Philadelphia Inquirer* came out with Fred G. Hyde's famous story: "We, Who Are Hurt, Now Beg. . . . Stop the Sale of FIREWORKS." A city was awake!

Just at that moment the State Legislature was about to be called into special session. If a model fireworks bill could be introduced in the "Call," we believed it might ride through on the current wave of public opinion.

The Governor was beset with demands for action and the State Council for the Blind rallied gallantly to our support in arranging for him to speak, over a state-wide hook-up, on the urgency of fireworks control. The speech was not to be given unless he was willing to announce his intention of asking the General Assembly to enact a prohibitory law. He made that announcement.

No sooner was the Legislature in session than fireworks bills became popular and many of all sorts were introduced.

The administration measure, House Bill 22, was defeated in the Senate by two votes. But public sentiment was not defeated and the subject was kept alive through organized effort until January, 1939, when the State Legislature met in regular session.

The Philadelphia Committee for Prevention of Blindness prepared House Bill 305 and it was introduced February 27. The *Philadelphia Inquirer* kept the subject constantly

at white heat with feature stories and editorials. Five other bills were introduced all except one of which were regulatory. Fireworks manufacturers kept a powerful lobby active constantly. There were controversy, delayed action in Committees, and amendments but finally No. 305 passed the House, as it was introduced, 169 to 8.

Bitter strife greeted the measure in the Senate and we had every reason to believe that it would never come out of Judiciary Special Committee, but The *Philadelphia Inquirer* hammered away with two or three stories every day; our small committee organized all but eight of Pennsylvania's sixty-seven counties in a concerted drive for enactment of the prohibitory law. Copy was sent to every daily newspaper in the state. There was a public hearing and fireworks manufacturers spoke loud and long in favor of 2" firecrackers, caps with .35 grain of powder, Roman candles with nine explosive compartments and other types of noise makers. The American Legion fought for toy pistols—they said there was a great deal of sentiment in the Legion about carrying a gun and they did not want their children and grandchildren deprived of that great privilege. The "sentiment" probably was responsible for H305 being amended in Judiciary Special to include paper caps and toy pistols.

Finally, when Pennsylvania spoke as one voice demanding a prohibitory fireworks law, 305 came out of the fiery furnace of controversy with only one change from its original state. It permits the use of paper caps with no more than .25 grain of powder. The Senate passed it and the Governor's signature was affixed May 15, 1939. The pen Governor James used was presented to the Philadelphia Committee for Prevention of Blindness, as a souvenir.

—EVELYN M. CARPENTER
Philadelphia Committee for Prevention of Blindness, Inc.
Philadelphia, Pa.

News of State Activities

THIS Section is devoted to the reporting of sight conservation activities carried on by official and voluntary agencies throughout the country. It presents information supplied by these groups, and serves as a medium for exchange of experiences. Brief and timely items only can be used, because of the limitations of space

Louisiana

"*Fireworks Campaign.*—Four-year campaign against the sale and use of fireworks conducted by our Society. City of New Orleans adopted fireworks ordinance in response to strong city-wide feeling, after scores of men, women and children were injured, many of them permanently, in the January, 1938, New Year celebration. Strong appeal made by our Society through the media of the press, radio and civic clubs, for rigid enforcement of the ordinance during the 1939 New Year celebration. Campaign resulted in a possible five or six injuries as compared with more than 400 for the year 1938.

"*Sight-Saving Classes.*—Sight-saving class established in Jefferson Parish. Class located in Gretna Primary School No. 1. Enrollment of ten students.

"*Parish Branches.*—The Society has added two new branches to our parish organizations. We now have six organized parish branches functioning under the direction of our Society. Chairmen have been selected from the medical profession and from among public-spirited citizens who are interested in helping our organization save sight.

"*Swimming Tank Conjunctivitis Campaign.*—Through co-operation of the State Board of Health, active campaign conducted to help eliminate 'pink eye.' Posters displayed in public swimming pools of the state."

—*Louisiana Society for Prevention of Blindness, New Orleans, Louisiana*

New Hampshire

"The talking slide film, 'The Nurse's Responsibility in Saving Sight,' has been used by the Sight Conservation Program of the

New Hampshire State Department of Public Welfare for educational purposes in four schools of nursing. At a public health nurses' meeting, the picture was used for demonstration while an ophthalmologist gave an interesting and instructive talk on sight conservation. Many nurses who have seen the film have made suggestions as to where it could be used to advantage in different sections of the state. We have received many fine testimonials.

"On June 15 and 16, the annual meeting of the New Hampshire Medical Society was held. The New Hampshire Department of Public Welfare had an exhibit which many doctors as well as lay people visited. The House of Delegates of the State Medical Society approved a Medical Advisory Committee on Eye Conditions to the State Welfare Department to include six ophthalmologists."

—Sight Conservation Program, State Department of Public Welfare, Concord, New Hampshire

Ohio

". . . During the two-year period in which the Commission's eye survey plan has been in operation, 60,000 school children have been cleared and over 500 serious eye conditions were detected which never previously had been suspected by local authority. Approximately 80 per cent of that group has received remedial care to the point where the condition has been 'permanently' corrected and the remainder are under observation or treatment. In addition to this number, several thousand displaying a need for refraction have been returned to parents or local service groups for this 'better sight' expedient.

"The effectiveness of this type of service is demonstrated in a number of ways, not the least significant of which is a reported 40 per cent reduction in classroom failures in one city system within a semester after completion of the survey.

"During May, 1939, we have conducted such a school eye survey in Mansfield city schools, Xenia city schools and in Green County schools. The immediate result of these services has been to strengthen the provision for sight-saving activity in the districts concerned and to insure better sight for the 250 school children clinically examined, and immediate surgical assistance to 25 serious cases.

"It is understood that the Commission is the only public agency that has established an extensive formalized survey of this nature to date."

—Ohio Commission for the Blind, Columbus, Ohio

Pennsylvania

"*Legislation.*—Several measures concerned with the prevention of blindness were introduced and enacted into law at the 1939 session of the State Legislature. A prohibitory Fireworks Bill, introduced and sponsored by the Philadelphia Committee for the Prevention of Blindness, became effective as of May 15, 1939, when it was signed by the Governor. This bill prohibits the use and sale of fireworks, except caps of 25/100 grains or less, unless used for licensed displays or other regulated purposes. A Reporting Bill introduced to amend the Act of 1913 regarding ophthalmia neonatorum was also sponsored by the Philadelphia Committee for the Prevention of Blindness. This bill, passed by the legislature but not yet signed, requires not only the reporting of finding of cases of ophthalmia neonatorum, but also the result of treatment. Two Syphilis Control Bills were introduced, relating to premarital and prenatal Wassermann tests. The bills will become effective in May, 1940.

"*Personnel.*—Miss Edith Gutzeit, formerly assistant to the supervisor of the Prevention of Blindness Department of the Pittsburgh Branch of the Pennsylvania Association for the Blind, has become the prevention of blindness worker for the Dauphin County Branch of the Association. Miss Sarah Moody, formerly with the Northampton County Branch, has recently been appointed assistant to the Supervisor, Conservation of Vision, State Council for the Blind at Harrisburg."

—*Prevention of Blindness Department, Pennsylvania Association for the Blind, Pittsburgh, Pennsylvania*

South Carolina

"The Department of Prevention of Blindness, as such, in the State of South Carolina has been existent for little over a year. It is under the Division for the Blind of the State Department of Public Welfare and is a separate unit from that of the Department of Public Assistance, which administers monthly grants to the needy blind and which is charged with the prevention of blindness and restoration of vision to persons with visual acuity of 20/200 or less in the best eye with best correction.

"With the co-operation of County Departments of Public Health, County Departments of Public Welfare, and lay persons in the community, the Division has conducted screening clinics in several counties in which there is no resident ophthalmologist. The clinics were generally and extensively advertised before the opening date and were available to all. As with school children, persons with

poor visual acuity were referred to the County Departments of Public Welfare for financial investigation. Those who were actually unable to obtain necessary services for themselves were notified to attend subsequent treatment clinics conducted by a qualified ophthalmologist. . . . When operations were advised, arrangements were made. When clinic examinations indicated need for further related treatment, the cases were immediately referred to the Department of Public Health.

"The State Department of Public Health submits weekly reports to our Division, referring all cases of opthalmia neonatorum reported to them. Our staff endeavors to follow these up and see that necessary treatment is given. As a result of this activity we found one baby whose eyes were in a very serious condition and required heroic treatment. She was hospitalized and her vision saved.

"The State of South Carolina has had no law making mandatory the use of a prophylactic in the eyes of newborn infants. Realizing that this need was fundamental in any program for the prevention of blindness, the Division worked toward passage of such a bill and is happy to report that this piece of legislation was enacted at the recent meeting of our General Assembly."

—Division of the Blind, State Department of Public Welfare, Columbia, South Carolina

Tennessee

"In the educational campaign which is being conducted by this Division, the talking slide film, 'The Nurse's Responsibility in Saving Sight,' prepared by the National Society for the Prevention of Blindness, has been utilized quite extensively. It was received by this Division in October of 1938 and during the past eight months it has been shown eighteen times before various groups such as nursing groups, parent-teacher associations, and one large group of social workers, reaching in all some 1,600 persons. In addition to the showing of this film, the head of this Division has always followed it with a short talk, adaptable to the group before which the picture was shown, on what that particular group could contribute to the prevention of blindness in their community and state, as well as on the causes of blindness in Tennessee, and their prevention. I feel that this film has been invaluable to me in my educational campaign and this Division will attempt to make this film available during the years to come to any group in the state making request for it. The head of this Division has also made some twenty-five talks to various groups over the state on the causes of blindness in Tennessee and their prevention, and it is hoped that he will be able to appear before many more groups in the years to come.

"The other major activity to which this Division is devoting a lot of its time is the establishment of sight-saving classes throughout the state. One class was established in September of 1938 in Nashville which cared for eleven visually handicapped children, and another is being planned to be established in Nashville in September of 1939 to care for the pre-high and high school grades, thus making available to visually handicapped children of Nashville a complete sight-saving class set-up from the first grade through the twelfth. A teacher for this class is to be trained this summer at Western Reserve University at Cleveland, Ohio, by a scholarship, established by the Centennial Club of Nashville, which is given annually for the training of a sight-saving class teacher or for the purchase of equipment for such a class. Last year this scholarship was used to purchase equipment, but the Centennial Club prefers that it be used in the future for the training of a teacher. The superintendent of the Tennessee School for the Blind is also planning to establish a sight-saving class in his school to care for children eligible for sight-saving classes. . . . Last year, 48 children attended the Tennessee School for the Blind, who had sufficient vision to enable them to obtain their education in sight-saving classes if they had been in existence in their communities. It is estimated by the head of this Division that Tennessee requires 83 such classes, and it is hoped by September of 1939 that four such classes will be available—one in the Memphis city school system, two in the Nashville city school system, and one at the Tennessee School for the Blind."

—Division of Prevention of Blindness and Conservation of Vision, Department of Institutions, Nashville, Tennessee

Washington

"Causes of blindness for 1,573 recipients of blind assistance in the State of Washington have been determined in a study just released as Publication No. 5, by the Division for the Blind, State Department of Social Security. Assisted by Dr. Purman Dorman, ophthalmologist, who serves as chairman of the Medical Eye Advisory Committee to the Division, staff members studied the characteristics of the blind, general diseases and local conditions causing blindness, major etiological classification, major topographical classification, and treatment by medical and surgical means.

"Among significant discoveries revealed by the study was the fact that blindness is definitely an affliction of the older ages, the median age being 66.5 years. With the exception of the 4.5 per cent who were born blind or who became blind in their first year, comparatively few individuals included in the study became blind until their 39th or 40th year.

"The study points out that, as age increases, infectious diseases which had their onset at a previous time begin to cause blindness. . . . It shows further that at the time of the initial eye examination, the examining physicians considered that the vision of one-sixth of the persons could be improved, or that further loss of sight could be prevented by surgery or other treatment. The possibility for improvement in vision by surgery was considered feasible for a larger proportion of persons in the older age groups than in the younger. This is due undoubtedly to the larger number of cataract cases among older persons. In the group 65–74 years of age, 21 per cent were recommended for treatment; in the group 75–84 years, 19 per cent; in the group 85 years and older, 16 per cent; while in the group under 35 years only 10 per cent received such recommendation. The 255 who were recommended for treatment had a median age of 69.4 years and the 1,318 not recommended for treatment had a median age of 65.9 years.

"In the field of prevention of blindness, it is indicated that, of the entire group studied, 11 per cent of the infectious diseases might have been or may yet be helped. In addition, 15 per cent of blindness from injury and 10 per cent of the congenital and hereditary types may yield to some form of treatment even though the patient has very poor vision. Many more might have been helped, according to the report, if the pathological process had been treated earlier, before actual blindness occurred.

"When those afflicted with conditions that cause blindness seek competent attention early, according to the study, these percentages will change and few persons will be irrevocably blind.

"Reports on surgical treatment indicate that during the 1937–1939 biennium 113 persons received operations. In addition, ten series of treatments were given in an endeavor either to prevent vision from becoming lost or to protect that little vision which remained."

—*Division of the Blind, State Department of Social Security, Olympia, Washington*

Current Publications on Sight Conservation

Note.—The National Society for the Prevention of Blindness presents the most recent additions to its stock of publications. Except for the more expensive ones, single copies are sent free upon request. Unless otherwise specified, they are reprinted from THE SIGHT-SAVING REVIEW. New publications will be announced quarterly.

295. The Rôle of Light in Education, N. Bishop Harman, F.R.C.S. 16 p. 10 cts. A history of the lighting of schoolrooms in Great Britain, including a discussion of the subject of daylight as well as artificial light.

296. The Head and Eye Protection Code of the National Bureau of Standards, M. G. Lloyd. 8 p. 5 cts. The author presents the history, the extent of application, and the effect of application of the head and eye protection code.

297. Fifteen Years' Progress in Eyesight Conservation in Industry, Louis Resnick. 12 p. 10 cts. Advances, remaining problems, cost of industrial accidents, and recommendations are discussed in this article.

298. The Industrial Eye Protection Program: How is it Set Up? How is it Put Across? How is it Kept Across? Harry Guilbert. 8 p. 5 cts. The author presents the economic as well as the humanitarian arguments for making the use of goggles in a plant a mandatory rule of employment.

299. Vision and Eye Protection: A Symposium. 28 p. 15 cts. This publication comprises Publications Nos. 296, 297 and 298, with an introduction by Dr. Leonard Greenburg, who was chairman of a meeting during the Greater New York Safety Council, March 27–8–9, dealing with this subject, at which these papers originally were presented.

300. Modern Conception of Conservation of Vision, Conrad Berens, M.D. 8 p. 5 cts. The author presents a popular article on some common problems of eye hygiene from youth through old age.

301. Prevention of Blindness from Ophthalmia Neonatorum. 28 p. 15 cts. This report was prepared in co-operation with the National Society for the Prevention of Blindness through its consultative relationship with the Committee on Conservation of Vision of the State and Provincial Health Authorities of North America. It has brought up to date material previously published in D63, "Prevention of Blindness in Newborn Babies," published in 1930.

302. The Story of a Fireworks Bill, Evelyn M. Carpenter. 8 p. 5 cts. This is the history of Pennsylvania's fight to get a fireworks bill which would be efficacious in preventing serious consequences.

Contributors to This Issue

N. Bishop Harman needs no introduction to prevention of blindness workers throughout the western world. In addition to his many activities in Great Britain, he is an honorary member of the International Association for the Prevention of Blindness.

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Co-author of "Eye Hazards in Industrial Occupations," **Louis Resnick** is Director of Industrial Relations of the National Society for the Prevention of Blindness, Inc.

Harry Guilbert is the Director of the Bureau of Safety and Compensation of The Pullman Company, and has for many years been a guiding spirit in accident prevention in industry.

Conrad Berens, M.D., a member of the Board of Directors of the National Society for the Prevention of Blindness, is a practicing ophthalmologist in New York City and surgeon and pathologist of the New York Eye and Ear Infirmary.